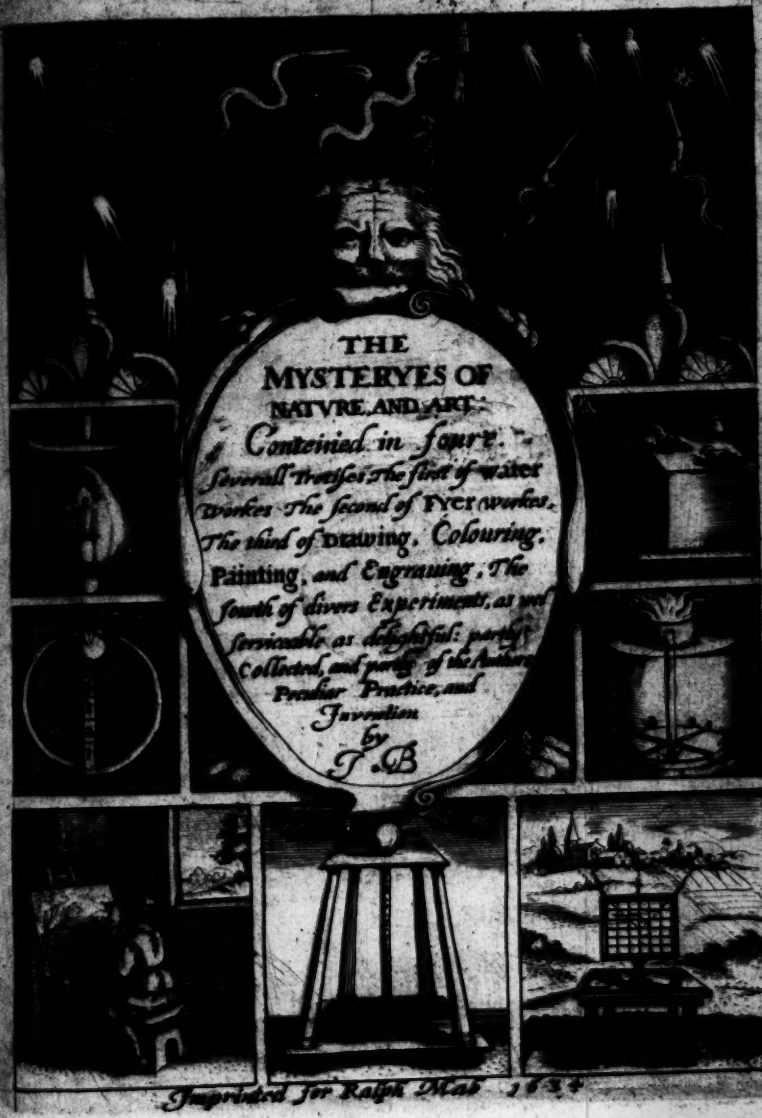

THE
MYSTERYES OF
NATVRE AND ART:
Conteiniad in Foure
Severall Treatises The first of water
Workes The Second of Fyer Workes,
The third of Drawing, Colouring,
Painting, and Engraueing, The
fourth of divers Experiments, as well
Seruiceable as delightfull: partly
Collected, and partly of the Authors
Peculiar Practice, and
Invention
by
I. B
Imprinted for Ralph Mab 1634

BIBLIOTHECA BODLEIANA

TO THE READER.

COurteous Reader, this ensuing Treatise hath lien by mee a long time, penned, but in a confused and undigested manner, as I gathered it, practised, or found it out by industry and experience. It was not in my minde to have as yet exposed it to the publique view: but being sollicited by the intreaties of some, and those not a few, to impart to each particular person what his *Genius* most affected; I was enforced as well for the satisfying of their requests, as for the a-

voydance of many inconveniences, to dispose in some order such Experiments as for the present I was content to impart. Expect no elegancy of phrase, for my time would not afford that, (nor indeed my selfe to be the transcriber.) I endeavored as much as I could, to write in plaine termes, that in regard of the easinesse thereof it might suit with the meanest capacity. The whole book consisteth of foure parts: The first whereof treateth of VVater-workes. The second of Fire-workes. The third of Drawing, Painting, Graving, and Etching. The fourth and last part treateth of severall Experiments, as well serviceable as delightfull: which because they are confusedly intermixed, I have entituled them *Extravagants*.

Now my chiefest ayme and end being the generall good, I could wish a generall

nerall acceptance, but that is too uncertaine to expect: I will content my ſelfe that I am already certaine that theſe my firſt and weak endeavours will finde acceptance with ſome, and I hope alſo with all honeſt and indifferent Readers; as for others, hap as hap may me, it is not to be doubted, but that I ſhall ſcape as well as many my betters have done before me. Farewell.

Your Wellwiller,

F. B.

To my friend the Authour, upon his Mysteries of Nature and Art.

WHen I ſcan over with a buſy eye
The timely fruits of thy vaſt induſtry,
Obſerving how thou ſearcheſt out the heart
Of Knowledge, through th' untrodden pathes of Art.
How eaſily thy active minde diſcries
Natures obſcure and hidden rarities,
No greater wonder than thy ſelfe I finde,
The chiefeſt rarity's thy active minde,
Which ſo fore-runs thy age. Thy forward ſpring
Buds forth betimes, and thou art publiſhing
Ev'n in the morning of thy day, ſo ſoone,
What others are to learne till th'afternoone.
Now ſince thy firſt attempts expos'd thou haſt
To publick cenſure, and the Dy is caſt,
Doubt not of good ſucceſſe: the early roſe
(Thou knowſt) is ſnatcht at, ev'n before it blowes.
Climbe higher yet; let thy quick-ſighted eyes
Venture againe for new diſcoveries:
Nor be thou mizer-like, ſo envious,
As to detaine what ere thou find'ſt, from us;
No, make the world thy debtor; be thou ſtill
As open-handed to impart thy skill,
As now thou art; and may thy teeming braine
Bring often forth ſuch luſty Births againe.

R. O.

Of Water-works.

IT hath been an old saying amongst Philosophers, and experience doth prove it to be true, *Non datur vacuum*, that is to say, Nature will not admit of any vacuity, or emptinesse. For some one or other of the Elements, but especially Ayre, and Water doe insert themselves into all manner of concavities, or hollownesses, in, or upon the earth, whether they are such as are formed either by Art or Nature. For the one it is so obvious, and manifest, as that it needs not any proofe at all. As for the other, I shall make it manifest unto you by easie demonstration. Let there be gotten a large vessell of glasse, or other, having besides the mouth another hole (though but a little one) at the top: poure water into the vessell by a tunnell thrust into the mouth of it, and you shall finde that as the water runneth into the vessell, a winde will

come forth of the little hole, sufficient to blow out a candle being held over it. This proveth, that before the water was poured into the vessell (though to our sight it appeared to bee empty) it was full of ayre, which forced out of the vessell as the water ran in; and the reason hereof is, because the water is by nature of a massie, subtill, substance; and the ayre of a windy, light, evaporative nature: The knowledge of this, with the rarifaction of inclosed ayre, is the ground and foundation of divers excellent experiments not unworthy the knowledge of any ingenious Artist whatsoever.

The order of the things contayned in the firſt booke.

EXperiments of drawing water by the Crane.
Experiments of drawing water by Engins.
Experiments of forcing water by ayre compreſſed.
Experiments of forcing water by Engins.
Experiments of producing ſounds by ayre and water.
Experiments of producing ſounds by evaporation of water by fire.
Experiments of producing ſounds by Engins.
Experiments of motions by evaporating water.
Experiments of motions by rarifying ayre.

The order of the things contained in
the first book.

Experiments of raising water by the Cane.
Experiments of raising water by Engins.
Experiments of raising water by compression.
Experiments of raising water by Engins.
Experiments of raising water by expansion of water.
Experiments of producing sound by expansion of water
by fire.
Experiments of producing sound by Engins.
Experiments of raising water by rarifying air.

Of VVater-workes.

To draw water by a Crane.

TAke any veſſell, of what bignes you pleaſe, fill it with water, then take a Crane (that is a crooked hollow Cane) one end whereof, let be ſomewhat longer then the other; put the ſhorter end of it into the veſſell of water, and let the longer end hang out of the veſſell, unto which longer end, put your mouth, and draw in your breath, and the water will follow; then withdraw your mouth, and you ſhall ſee the water runne ſo long, till it come equall to that end of the Cane which is within the veſſell.

Another.

TAke a deepe veſſell, having two loopes on one of the ſides, fill it nigh full with water: then take a hollow Cane, like unto the aforeſayd, but let there bee faſtned unto the ſhorter end a wooden diſh; put the longer end

heereof through the loopes on the ſide, and that end that hath the diſh faſtned unto it into the veſſell of water, with your mouth as you did in the former, draw out the ayre, and you ſhall ſee that as the water runneth out, the Crane will ſinke lower and lower, and ſo will continue running untill the veſſell bee drawen empty.

How to make a conceited pot, which being filled with water, will of it ſelfe run all out; but not being filled will not run out.

MAke, or cauſe a pot to bee made of what faſhion beſt liketh your mind, and make a large hollow cane to ſtand up in the midſt thereof; having at the bottome 2 or 3 ſmall holes; let the top of this cane be cloſe: then make a hole in the bottome of the veſſell, and put up a little cane hollow at both ends, into the other cane, ſo that the one end therof may almoſt touch the top of the great cane, and it is done. Note, that if you put into this veſſel ſo much liquor, that it ſwimme above the top of the cane, it will of its owne accord, run and never ceaſe ſo long as

there is any liquor in the veſſell; but if you fill it below the cane, it will not run at all of it ſelfe: the reaſon whereof is this; the ayre being the lighter element, doth aſcend into the higher place, but being drawne as in the two firſt demonſtrations out of the Crane, or forced, as in this, by the weight of the water in the veſſell, the water then tendeth downewards unto its proper place.

How

How to dispose 2 vessels upon one foot, that so much wine may runne out of the one, as you shall put water into the other.

LEt A, B, C, D, be the foot, at each end whereof, place a vessell equall in bigneſſe, the one to the other; as D, E; alſo let there paſſe a hollow cane from the one to the other, as A, R, A, the ends wherof muſt almoſt touch the tops of the ſayde veſſels; in the veſſell D, there muſt bee a hollow pipe, as F, whereby you may by help of a tunnel powr water into the veſſell: alſo in the veſſell E, there muſt be a crane, as G; now if you fill the veſſel E with wine almoſt unto the top of the crane, and afterwards ſtoppe the mouth of the veſſell, that the ayre may not breath foorth, it will not run of it ſelfe: but if you put water into the veſſell D, the ayre contayned in it, will paſſe through the hollow pipe, A, R, A, into the veſſel E, where ſtriving for a greater quantity of roome, it preſſeth the wine out of the veſſell E, (by the crane) anſwerable in quantity unto the water powred into the veſſell D.

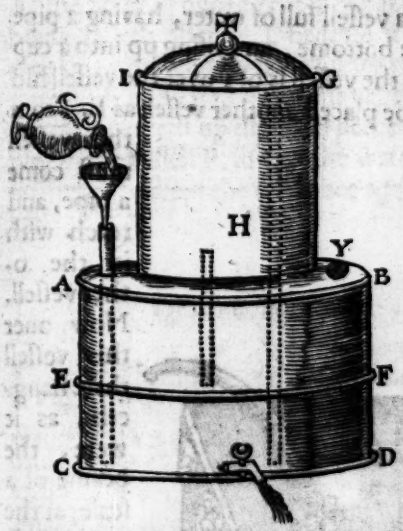
How to dispose 2 vessels upon one foot, the one being empty, and the other almost full of wine, and yet shall not runne out of the vessell, unlesse you fill the empty vessell with water, and then the one shall run pure wine, the other fayre water.

LEt there bee 2 vessels placed upon one foot, having a hollow cane passing from one to the other (as I taught in the precedent probleme) but let there bee 2 cranes as F, G, one in each vessell; then fill one of the vessels with wine, but not above the crane, so it will not runne of it selfe: but if you powre water into the other vessell, untill it bee full, it will cause that wine shall runne out of the one, and cleare water out of the other.

To make that the water conteined in one vessell, shal ascend into another vessell placed above it.

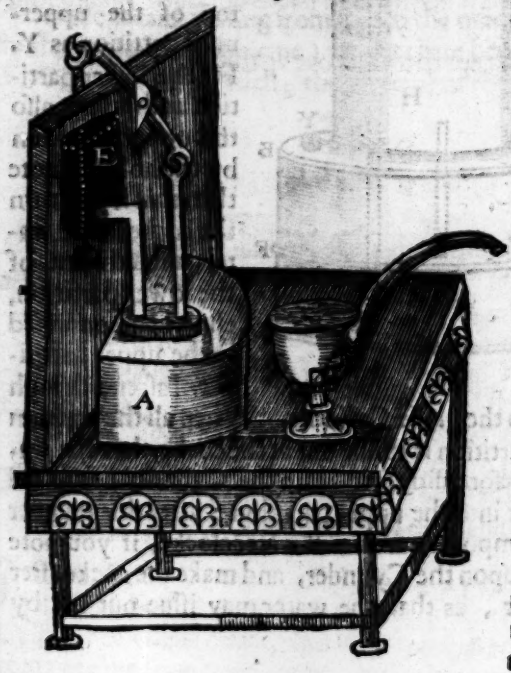
LEt A, B, C, D, bee a vessell having a partition in the middle, as E, F, let there be placed upon this vessell, a Cylinder of Glasse cleare, and very transparant, that will contayne the same quantity of water, that one of the partitions

titions will, as I, G, H; in the lowermoſt partition towards the bottome, let there bee a cocke, and out of the ſame veſſell let two pipes be made to paſſe, the one whereof reacheth almoſt unto the top of the Cylinder, the other muſt come out by the ſide of the Cylinder: alſo out of the upper partition there muſt come another pipe. Moreover there muſt be a hole, through the top of the uppermoſt partition as Y. Fill the lower partition at the pipe, alſo the upper partition by the hole Y: note then that if you turn the cocke as the water runneth out of the lower partition, the water contained in the upper partitiõ wil aſcend throgh the pipe into the glaſſe Cylinder. When all the water in the lower partition is runne out at the cocke, then the water which before did aſcend into the Cylinder, will fall backe againe into the upper partition: after this manner may you compoſe an artificiall water clocke, if you note the howres upon the Cylinder, and make the cocke after ſuch manner, as that the water may iſſue out but by droppes.



To make a cup or vessell that so oft as you take the liquor out of it, so oft it shall fill it selfe, but never runne over.

SVppose A to bee a vessell full of water, having a pipe comming from the bottome, and rising up into a cup of the just height that the vessell is of; over the vessell fild with water, let there be placed another vessel, as E. From this vessell must come a pipe, and reach with in the other vessell. Now ouer this vessell there hangeth, as it were, the beame of a scale; at the one ende whereof, is fastened a peece of boord, having a leather nayled upon the top; at the other



other end of this beame muſt hang a weight, but not full ſo heauie as the peece of boord lethered is. Fill both theſe veſſells with water, and the cup alſo; note then, that if you ſucke out the water in the cup by the pipe on the ſide of it, the water in the veſſell will come into it, untill it is in both of equall height: now as the water falleth downe in A, the peece of boord that is hanged unto one end of the beame falleth after it (becauſe it is heauier then the weight) and ſo giueth way unto the water in E, which runneth into it; and when the veſſell is filled againe with water, it beareth up the ſayd peece of boord againſt the pipe of the veſſell E, ſo that the water can run out thereat no longer, except the water bee againe drawne out of the cup:

Of drawing water by Engines.

BEfore I begin with theſe, take a word or two by the way. Let it bee a generall notion that no engine for water workes of what ſort ſoeuer, whether for ſeruice, or meere pleaſure, can be made without the help of Succurs, Forcers, or Clackes; euery of which, I haue orderly explayned both by words and demonſtratiue figures.

A Succur is a box, which is made of braſſe (hauing no bottome) in the middeſt of which, there is a ſmall bar goeth croſſe, the ſame hauing a hole in the middle of it; this box hath a lid ſo exactly fitted unto it, that being put into it, no ayre nor water can paſſe betweene the creniſe: this couer hath a little button on the top, and a ſeame that goeth into the box, and ſo through the hole of the aforeſayd croſſe barre, and afterwards it hath a little button riueted

on

on it, so that it may with ease slip up and downe, but not be taken, or slip quite out.

A Forcer is a plug of wood exactly turned and leathered about; the end that goeth into the barrell, is semicircularly concaue.

A Clacke is a peece of Leather nayled ouer any hole, hauing a peece of lead to make it lie close, so that the ayre or water in any vessell may thereby bee kept from going out.

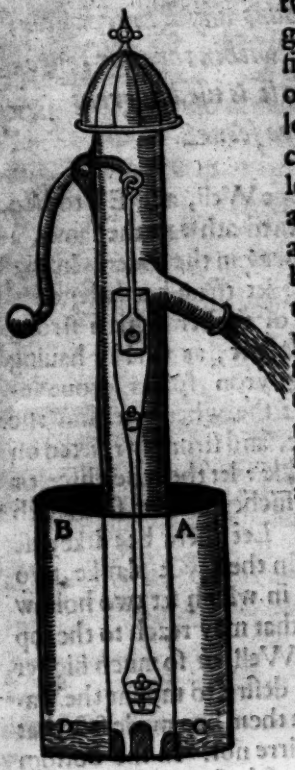
How to harden Leather, so as the same shall last much longer in succurs of Pumps, then it doth unprepared.

LAy such Leather as is well tanned to soake in water, wherein there hath beene store of iron filings a long time, or else in the water that hath lien a long time under a grinstone, into the which such yron as hath beene from time to time ground away, hath fallen and there setled.

The making of a Pumpe to draw water.

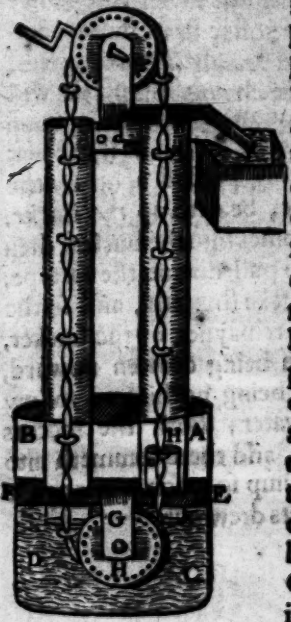
SVppose A B C were a deepe Wel, wherein you would make a Pumpe to draw water to the surface or superficies of the earth. First therefore you must prouide a pipe of Lead, or a peece of timber bored through, so long as will reach unto the bottome of the Well: that part that standeth in the water must bee cut with two or three arches, as it were, if it be wood; if Leade, it must haue somewhat to beare it a little from the bottome, that the water may thereby bee let into the pipe. Towards the bottome

bottome of the pipe in the water there muſt bee faſtned a ſuccur; alſo another of theſe ſuccurs muſt be faſtned about two foot aboue the top of the ground; then haue a bucket fitted unto the hole of the wood or leaden pipe; let it bee well leathered about, and haue a clacke at the bottome of it, and let it bee hanged with a ſweepe as the figure ſheweth: note that after you haue filled the diſtance betweene the lower ſuccur, and the bucket with water, that if you lift up the ſweepe, it will thruſt downe the bucket upon the water, and preſſe it, the water being preſſed upon by the bucket, beareth up the clacke, and comes into the bucket; then if you pull downe the ſweepe, the clacke ſhutteth, and ſo the water remaynes in the bucket, which being drawen upward, there being nothing to ſollow but water, both the ſuccurs open, and there commeth into the pump ſo much water as the buckets drew out.



The making of an Engin, whereby you may draw water out of a deepe Well, or mount any River water, to be conveyed to any place within three or foure miles of the same. Also it is used in great ships which I have seene.

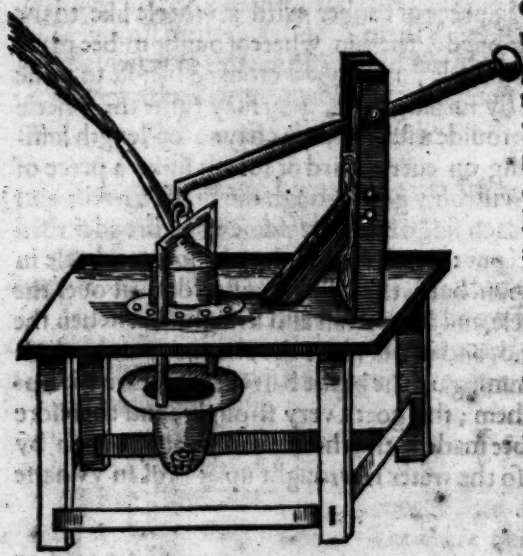
SVppose A B C D to be a deepe Well, and E F to be a strong peece of timber fastned athwart the same, a good way in the water. In this planke let there bee fastened a peece of timber with a strong wheele in it, as G H, having strong yron spikes droue athwart the wheele within the creuise, and strongly riueted on each side: let them be three or foure inches distant from each other. Let there bee likewise made in the sayde planke two holes, in which set two hollow posts, that may reach to the top of the Well, or so much higher as you desire to mount the water; let them bee made fast that they stirre not. In the bottom of one of these posts, there must be fastned a barrell of brasse, as G H, made very smooth within, and betwixt those two posts at the top; let there bee fastned unto them both another peece



peece of ſtrong timber to hold them faſt, leſt they ſtart aſunder; and in the midſt of that make a mortice, and in it faſten a ſtrong peece of timber with a wheele like to the former mentioned; the pin whereof ought to bee made faſt unto the wheele, and haue a crooked handle to turne about, that by turning of it, you may turne the wheele alſo. Then prouide a ſtrong yron chayne of length ſufficient, hauing on euery third or fourth linke a peece of horne, that will eaſily goe through the braſſe barrell, and a leather of each ſide of it, but ſomewhat broader then the horne; put this chayne under the lower wheele in the Well upon both the hollow poſts, draw it ouer the upper wheele, and linke it faſt and ſtraight. Turn then the handle round, and it will turne the chayne round, whoſe leathers comming up the braſſe barrell, will beare the water before them; this goeth very ſtrongly, and therefore had neede bee made with wheeles and wrought upon by horſes, for ſo the water is wrought up at Broken Wharfe in London.

To make an Engin, which being placed in water will caſt the ſame with violence on high.

LEt there be prepared a ſtrong table, with a ſweepe faſtened at the one end thereof, to lift up and downe; unto the end of the ſweepe, let there be linked a peece of yron hauing two rods of length ſufficient; let there bee made a hole quite through the midſt of this table, whoſe diameter let be about fiue or ſix inches; then prouide two peeces of braſſe in forme of hattes, but let the brim of the uppermoſt be but about one inch broad, and haue diuers little holes round about it; alſo in the crown of this muſt



bee placed a large ſuccur, and ouer it a half globe, frō the top of which, muſt proceed a hollow trunke aboute a yard long, and of a good wide bore; then take good liquored leather, 2 or 3 times double, & put betweene the board and the brims of this, and with diuers little ſcrews put through the holes of the brimme, ſcrew it faſt unto the top of the table. Note that the table muſt bee leathered alſo underneath the compaſſe of the brimme of the lower braſſe. Now the lowermoſt braſſe muſt be of equal diameter (in hollowneſſe) unto the other, but it muſt be more ſpirall towards the bottome, and muſt haue eyther a large clacke or ſuccur faſtned in it; alſo the brim of this muſt be larger then that of the uppermoſt, and haue two holes made about the midſt on each ſide one; bore then 2 holes

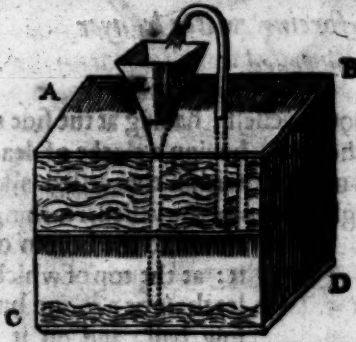
holes in the table, on each ſide of the braſſe one, anſwerable unto the holes of the brim of the lower braſſe, throgh which holes put the two rods, of the yron hanged unto the ſweepe through them, and riuet them ſtrongly into the holes of the lower braſſe. Place this in water, and by mouing the ſweepe up and downe, it will with greater violence caſt the water on high.

Experiments of forcing water by ayer compreſſed.

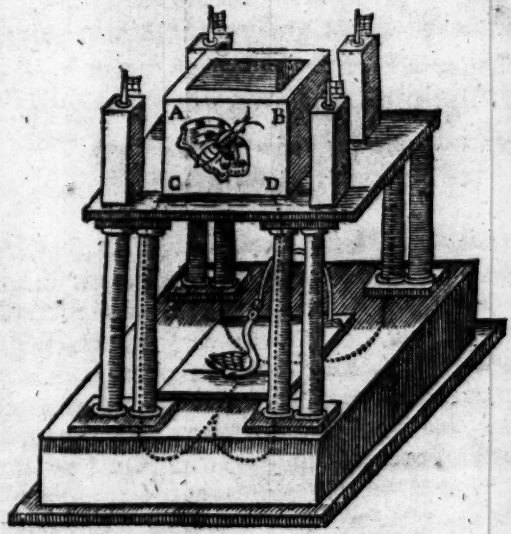
LEt there bee a large pot or veſſell, hauing at the ſide a peece of wood made hollow, hauing a clacke of leather with a peece of lead upon it, within the veſſell alſo let there be a pipe through the top of the veſſell, reaching almoſt to the botom of it: at the top of which let there be a round hol low ball, and on it a ſmall cocke of braſſe. Note that if you fill the ſaid veſſell halfe-full of water, and blow into the hole of the pipe, at the ſide, your breath will lift up the clack, and enter the veſſell, but when it is in, it will preſſe down the clack: blow into it oftentimes, ſo ſhall there bee a great deale of ayre in the veſſell, which will preſſe ſo hard upon the water, that if you turne the cock at the top, the water in the veſſell will ſpin out a good while.

Another.

LEt A, B, C, D, be a great veſſell, having a partition in the middle: let there bee a large tunnell at the top of it, E, F, whoſe neck muſt go into the bottom almoſt of the lower veſſell: let there be a hollow pipe alſo coming



out of the partition, and almoſt touch the top of the upper veſſell. In the top of the upper veſſell let there bee another pipe, reaching from the bottom of the upper veſſell, and extending it ſelfe out of the veſſell a good way: let the top of it hang over the tunnell. In the top of the upper veſſell let there be a hole beſides, to be ſtopped with cork, or otherwiſe: when you will uſe it, open the cork-hole, and fill the upper veſſel with water: then ſtop it cloſe againe, and poure water into the tunnell, and you ſhall ſee that the water in the upper veſſell will run out of the pipe into the tunnell againe. and ſo will continue running untill all the water in the upper veſſell be run out. The reaſon thereof is this; the water in the tunnell preſſing the ayre in the lower veſſell, maketh it aſcend the pipe in the partition, and preſſe the water in the upper veſſell, which having no other way but the pipe, it runneth out thereat.



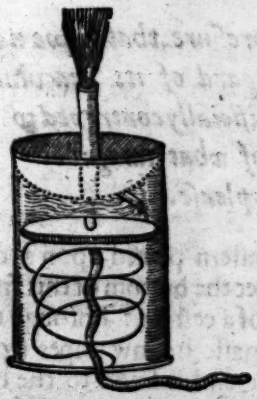
Place this betweene folio 14. and 15.

The forcing of water by preſſure, that is the naturall courſe of water in regard of its heavineſſe and thinneſſe, artificially contrived to break out of what image you pleaſe.

LEt A, B, C, D, bee a ceſtern placed upon a curious frame for the purpoſe, let the bottom of this frame be made likewiſe in the form of a ceſtern: Through the pillers of this frame let there paſſe hollow pipes from the bottom of the upper ceſtern, and deſcend to the bottom of the lower ceſtern, and then run all to the middle thereof, and joyne in one, and turne up into the hollow body of a beaſt, bird, fiſh, or what your fancy moſt affecteth: let the hole of the image whereat the water muſt break out, be very ſmall, for ſo it will run the longer. Fill the upper ceſtern with water, and by reaſon of the weight thereof it will paſſe through the pipes, and ſpin out of the hole of the image.

Experiments of forcing water by Engins.

LEt there bee an even ſtreight barrell of braſſe of what length and bigneſſe you pleaſe: let the bottom of it be open, and let the top be cloſed, but ſo that it be hollow on the outſide like a baſin: in the midſt whereof let there bee a ſtraight pipe erected, open at both ends, alſo let there be another ſhort pipe at the ſide of it, which let bee even with the top of the baſin on the outſide, but ſtand a little



little from it on the ſide Having thus prepared the barrell, fit a good thick board unto it, ſo that it may ſlip eaſily up and down from the top of the barrell unto the bottom, nayle a lether about the edges of it, and another upon the top of it: on the underſide of it let there be faſtned a good ſtiffe, but flexible ſpring of ſteele, which may thruſt the board from the bottom to the top of the barrell: let the foot of this ſpring reſt upon a barre faſtned acros the bottom of the barrell; let this board alſo have tied at the middle a little rope of length ſufficient. When you uſe it, bore a little hole in the table that you ſet it on, to put the rope thorow, and pull the rope down, which will contract the ſpring, and with it draw down the board: then poure in water at the baſin untill the veſſell be full: Note then, as you let ſlack the rope, the water will ſpirt out of the pipe, in the middle, and as you pull it ſtraight, the water will run into the veſſell againe. You may make birds, or divers images at the top of the pipe, out of which the water may break.

Another

Another manner of forcing water, whereby the water of any ſpring may be forced unto the top of a hill.

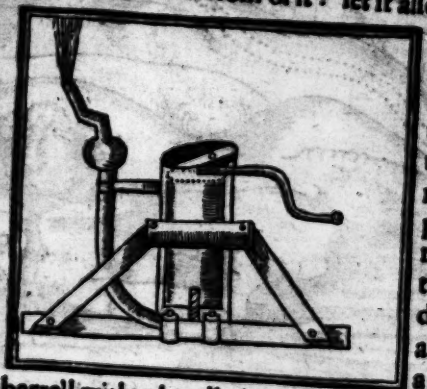
LEt there be two hollow poſts, with a ſuccur at the bottom of each, alſo a ſuccur nigh the top of each: let there be faſtned unto both theſe poſts a ſtrong peece of

timber, having, as it were, a beame or ſcale pinned in it, and having two handles, at each end one. In the tops of

both these hollow posts fasten two brasse barrels, made very even and smooth within, unto these two barrels let there be fitted two forcers, lethered according to art, at the tops of these forcers must be fastned two yrons, which must bee linked unto the aforesaid beam; from each post below towards the end of the barrels, let there bee two leaden pipes, which afterward meet in one, to conduct the water up to the place desired, which if it bee very high, there will be need of some succurs to catch the water as it cometh.

The description of an Engin to force water up to a high place: very usefull for to quench fire amongst buildings.

LEt there be a brasse barrell provided, having two succurs in the bottom of it: let it also have a good large



pipe going up one side of it with a succur nigh unto the top of it, and above the succur a hollow round ball, having a pipe at the top of it made to screw another pipe upon it, to direct the water to any place. Then fit a forcer unto the barrell with a bandle fastned unto the top; at the upper end of this forcer drive a strong screw, and at the lower

end

end a ſcrew nut, at the bottom of the barrell faſten a ſcrew, and at the barre that goeth croſſe the top of the barrell, let there be another ſcrew nut: put them all in order, and faſten the whole to a good ſtrong frame, that it may ſtand ſteddy, and it is done. When you uſe it, either place it in the water, or over a kennell, and drive the water up to it, and by moving the handle to and fro, it will caſt the water with mighty force up to any place you direct it.

Experiments of producing ſounds by ayer and water.

LEt there bee had in a readineſſe a pot made after the forme of the figure following, having a little hole at the top, in the which faſten a reed or pipe, alſo another little hole at the bottom: preſſe this pot into a bucket of water, and it will make a loud noyſe.

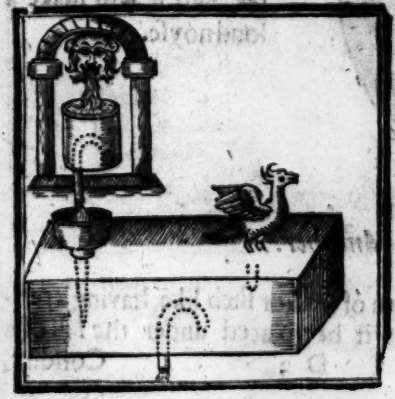
Another.

LEt there be a ceſtern of lead or ſuch like, having a tunnell on the top: let it bee placed under the fall of a

Conduit, and at the one end of the top, let there come out of the vessell a small pipe, which let bee bent into a cup of water, and there will be heard a strange voice. Over

this pipe you may make an artificiall tree with diuers birds made to sit therein.

How to make that a bird sitting on a basis, shall make a noise, and drink out of a cup of water, being held to the mouth of it.

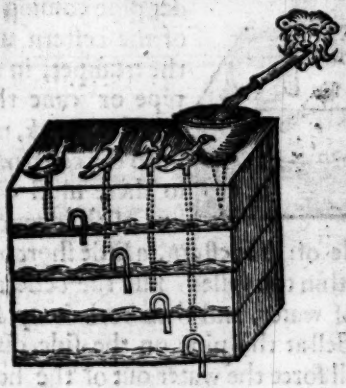


PRovide a cestern, having a tunnell at the one end of the top, and a little cane coming out of the other end of the vessell; on the top of which let there be a bird made to sit, also at the bottom of the cestern, let there bee a crane to carry away the water as it run-

runneth into the vessell. Place this vessell with its tunnell under the fall of a conduit of water, and the bird will sing; and if you hold a cup of water under his bill, hee will drink and make a noise.

A device whereby severall voyces of birds cherping may be heard.

PRepare a cestern having divers partitions, one above another; let them all have cranes in the bottoms to carry the water from one to another; also let each cestern have his severall pipe, all of them coming out at the top of the cestern, on whose tops let birds bee artificially made, with reeds in them: also in the top of the upper cestern let there bee a tunnell. Place it under the fall of a conduit of water, and you shall heare so many severall voyces as there are birds.



A device whereby the figure of a man standing on a basis shall be made to sound a trumpet.

PRepare a cestern having within on the lid fastned a concave hemisphere, in whose bottom let there bee

made one or two holes: let there also be a hole in the top of the sayd cestern, whereby it may bee filled with water as occasion serveth. Also let there bee made to stand on the top of this cestern the image of a man holding unto his mouth a trumpet: this image must likewise have a slender pipe coming out of the cestern unto the trumpet, in this pipe or cane there must be a cock, nigh unto the cestern. Also there must come out of the concave hemisphere at the side of the cestern, a little short pipe, having a clack on it within the vessell. Fill the cestern about two thirds full of water, and then cork it up fast, blow then into the vessell at the pipe on the side divers times, and the ayer will force the water out of the hemisphere, and make it rise up on the sides of it; turne then the cock, and the weight of the water will force the ayer out of the pipe, and so cause the trumpet to sound.

Hercules shooting at a Dragon, who as soone as he hath shot, bisseth at him.

LEt there be a cestern having a partition in the midst, in the partition let there bee a deep succur, having a small

ſmall rope faſtned unto the top of it : let the one end of the rope come out of the upper lid of the ceſtern, and bee faſtned unto a ball, the other part thereof let it be put under a pulley (faſtned in the partition) and let it be carried alſo out of the upper ceſtern, and be faſtned unto the arme of the image, which muſt bee made to ſlip to and againe, and to take hold of the ſtring of a ſteele bow that is held in the other hand. At the other end of the ceſtern let there bee made an artificiall image of a Dragon, through whoſe body muſt come a ſmall pipe with a reed artificially faſtned in the upper part thereof. Note then, that when you put up the ball, the image will draw his bow, and when you let it fall, the Dragon will hiſſe.

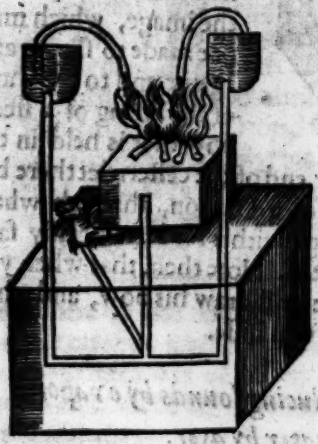
Experiments of producing ſounds by evaporation of water by ayer.

PRepare a round veſſell of braſſe, or latin, having a crooked pipe or neck, whereto faſten a pipe : put this veſſell upon a trevet over the fire, and it will make a ſhrill whiſtling noyſe.

To

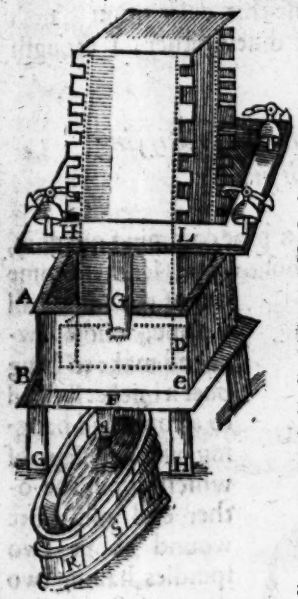
To make two images sacrificing, and a Dragon hissing.

PRepare a cestern having an altar of brasse or tin upon it, let there be in the cestern a hollow pipe turning up out of the cestern at each end; also in the middle within the altar, also on the side of the altar into the body of a dragon artificially made, with a reed in the mouth of it. Let there bee two boxes at the tops of the pipes, on the ends of the cestern, having two crooked pipes or cranes comming out of them. Fill the boxes with water when you occupy it, also put fire upon the altar, and the dragon will hisse, and the water in the two boxes being wrought upon by the heat of the fire comming thorow the pipes, will drop into the fire. These two boxes ought to be inclosed in the bodies of two images, and the two short cranes comming out of them in her armes and hands.



Experiments of producing ſounds by Engins.

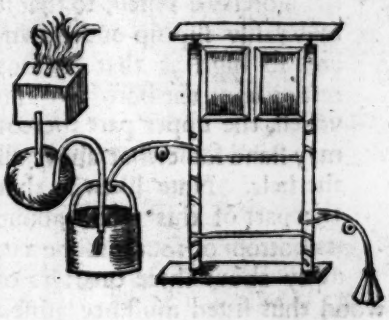
PRepare a veſſell after the forme of the figure marked with the letters A, B, C, D, place it upon a frame, as F, G, H; this veſſell muſt have a hole in the bottom, with a pipe faſtned in it, as Q, to convay the water conteyned in it into a veſſell or tub ſet under it, marked with the letters R, S, T, alſo a frame muſt bee faſtned at the top of it, as G, H, L, having ſo many bels with little beaters or hammers to them (artificially hanged) as are requiſit to expreſſe your dedeſired tune: Laſtly provide a ſollid peece of timber, whoſe lower part muſt bee fitted unto the aforeſayd veſſell, ſo that it may eaſily ſlip up and down, and ſo high as that its foot reſting upon the bottom of the veſſell, the upper part thereof may ſtand ſomewhat above all the bels. Note likewiſe that that part of this wood aboue its bottom or foot muſt be cut away about three quarters of an inch. Vpon this wood thus fitted muſt bee faſtned ſeverall pins equall unto each bell, from the top unto the foot thereof, ſo diſpoſed that they may orderly preſſe down the inward ends of the hammers of each bell, ac-



cording as the tune goeth: when you use it, fill the cestern almost with water, and put the fitted peece of timber into it, and as the water runneth out at the bottom, it it will play upon the bels: note that it were very requisit to haue a cock fastned to the pipe on the bottom of the vessell, that therewith you might at your pleasure stay the water. The like engines might be made to play upon wyer strings disposed upon a concavous water, to make the musick resound, but because this description giueth light enough for the framing of diuers other, I thought good here to omit them.

Experiments of motions by rarifying water with fire.

LEt there be an altar having a pipe comming out of it, and entring the body of a hollow ball, let there come out of the same ball a crane, whose lower end make to hang ouer a bucket fastned to a rope, and hanging ouer a pulley, of which rope the other end must bee wound about two spindles, hauing two doores fastned unto them, and at the end of the same rope let there bee a waight fastned. So the fire on the altar will cause the water to distill out of the ball into the bucket, which when by reason of the water



water it is become heuier then the weight, it will draw it up, and ſo open the ſaid gates or little doores.

Experiments of motions by rarifying ayre by fire.

LEt there be a round veſſell of glaſſe, or horn, and on the top of it a veſſell of braſſe, and in the midſt a hollow pipe ſpreading it ſelfe into foure ſeuerall branches at the bottom: the ends of two of the branches muſt turn up, the ends alſo of two muſt turn down; upon theſe foure branches faſtén a light cord, with ſeuerall images ſet upon it. Rarifie the ayre thē by laying a red-hot iron upon the top of the braſſe or tin veſſell, and it will turn the wheele about, ſo that you would think the images to bee living creatures.

Another way.

FIrſt prepare a round peece of wood, hauing a braſſe box in the midſt, ſuch as they make to hang the mariners compaſſe with, but a good deale bigger, round about this peece of wood faſten divers ſhreds of thin lattin,

ſtanding obliquely or aſcew, as the figure doth repreſent; round about theſe faſten a coffin of thin paſtbord, cut into

ſeuerall formes of fiſhes, birds, beaſts, or what you pleaſe. Prepare a lantern with oyled parchment, ſufficient to conteine it, in the midſt of whoſe bottom muſt bee erected a ſpindle with a narrow point, to hang the paſtbord cut into formes upon: upon each ſide let there be a ſocket for to ſet a candle in, alſo let there bee made a doore in the bottom to put the candles in at, and after to be ſhut, and it is done. If you ſet two candles in the ſockets, the heat of them will turne the whole paſtbord of formes round.

Amongſt all the experiments pneumaticall, there is none more excellent than this of the Weather-glaſſe: wherefore I haue laboured to deſcribe the making thereof as plainly as it poſſibly might be.

What the Weather-glaſſe is.

A Weather-glaſſe is a ſtructure of, at the leaſt, two glaſſes, ſometimes of three, foure, or more, as occaſion ſerueth, incloſing a quantity of water, and a portion of ayre proportionable, by whoſe condenſation or rarifaction the included water is ſubject unto a continuall motion, either vpward or downward; by which motion of the water is commonly foreſhewn the ſtate, change, and alteration of the weather. For I ſpeak no more than what mine experience hath made me bold to affirme;

you

you may (the time of the yeere, and the following obſeruations underſtandingly conſidered) bee able certainly to foretell the alteration or uncertainty of the weather a good many houres before it come to paſſe.

Of the ſeuerall ſorts and faſhions of Weather-glaſſes.

THere are diuers ſeuerall faſhions of Weather-glaſſes, but principally two.

1 The Circular glaſſe.

2 The Perpendicular glaſſe: The Perpendiculars are either ſingle, double, or treble.

The ſingle Perpendiculars are of two ſorts, either fixt or moueable.

The fixt are of contrary qualities; either ſuch whoſe included water doth moue upward with cold, and downward with heat, or elſe upward with heat, and downward with cold.

In the double and treble Perpendiculars, as the water aſcendeth in one, it deſcendeth as much or more in the other.

In the moueable Perpendicular the glaſſe being artificially hanged, moueth up and down with the water.

How to make the water.

I Muſt confeſſe, that any water that is not ſubiect unto putrifaction, or freezing, would ſerue the turne, but Art hath taught to make ſuch a water as may bee both an ornament to the work, and alſo delectable to the eye.

Take two ounces of vardigreaſe in powder, and infuſe

it ſo long in a pint of white wine vineger, untill it hath a very green colour, then poure out the vineger gently from the vardigreaſe: take alſo a pint and a halfe of purifide May-dew, and put therein 6 ounces of Roman vitreoll in groſſe powder, let it ſtand till the vitreoll bee throughly diſſolved; then mix this with the former water, and ſtrain them through a cap paper, and put it into a cleane glaſſe well ſtopped, and its ready for uſe.

Another.

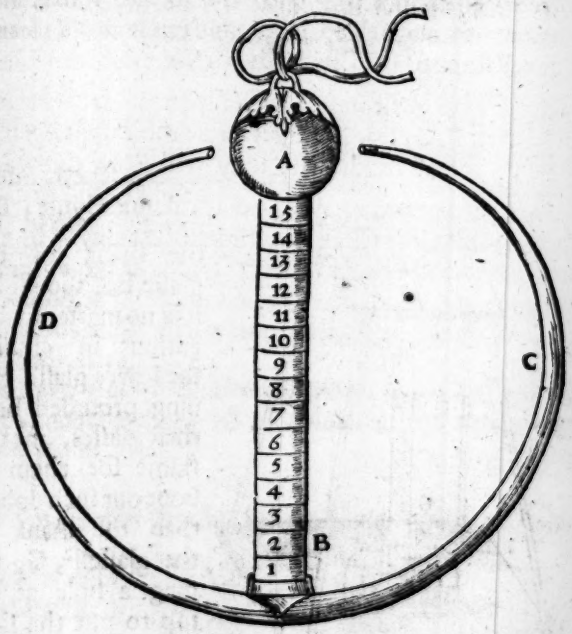
TAke a gallon of rayn-water that hath ſetled, infuſe therein a day and a night 4 pound of quick lyme; ſtir it about with a cleane ſtick oftentimes in the day; in the morning poure the cleere water off from the lyme, into a braſſe pan, and adde thereto 3 pound of ſal armoniack; let it ſtand fiue or ſix houres, afterwards ſtir it about untill it be of a perfect blew colour, then ſtraine it through a browne paper rowled within a tunnell, and reſerue it for your uſe. This water is not ſo good for uſe as the former.

How to make the Circular glaſſe.

FIrſt you muſt prepare two glaſſes, the faſhion whereof let be like unto the figures marked with the letters A, B, and C, D. The glaſſe C, D, is open at both the ends, alſo in the middle there is a neck comming up of ſufficient wideneſſe to receiue the ſhank end of the glaſſe marked with the letters A, B. Then fill the glaſſe C, D, a third part, with either of the waters, and diuide the glaſſe into ſo many equall parts as you would haue degrees; rarifie

the

the ayre in the head of the glaſſe A, B, by holding it to the fire, which being yet warme, reuerſe the ſhank of it into the neck of the glaſſe C, D. Note that if the water do not aſcend high enough, you muſt take the glaſſe A, B, out againe, and heat it hotter; if it aſcend too high,

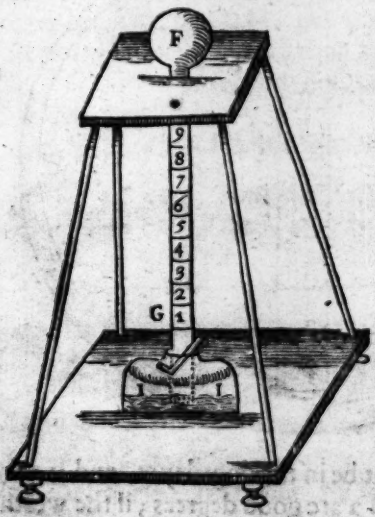


heat it not ſo hot. If it be in the dog-dayes, and extreme heat of ſummer, 1 and 2 are good degrees; if the weather be moſt temperate, then 3 and 4 are beſt; if a froſt, 9 or 10. When you haue hit an indifferent degree, lute the joynts very cloſe, and faſten a ribben unto the top of the glaſſe

glaſſe to hang it by. In this glaſſe the water will with cold aſcend the glaſſe A, B, with heat it will deſcend the glaſſe A, B, and aſcend the hornes of the glaſſe C, D.

How to make the ſingle perpendicular glaſſe, whoſe water aſcendeth with cold, and deſcendeth with heat.

PRepare two glaſſes after the faſhion of theſe figures underſet, F, G, I, I. Alwayes chuſe thoſe upper glaſſes that haue the leaſt heads, elſe they will draw the water too faſt, and preſſe it too low: alſo let not the ſhank of the glaſſe bee too wide: it is no matter to bee curious in chuſing the lower glaſſe. Hauing prouided both theſe glaſſes, make a frame for them about one inch longer than the ſhank of the glaſſe F, G, hauing a hole at the top to put the ſame thorow. There ought to he a great deale of care had in making the frame ſo, that the foot thereof may bee of a greater compaſſe than the top, to the end that it may ſtand firm, and not be ſubject to be turned down, which will diſtem-



per

per the whole work. After you have provided the frame, proceed to the making of it after this manner. Put both the glaſſes into the frame, and then divide the ſhank of the glaſſe F, G, into ſo many equall parts as you would haue it haue degrees; write figures upon paper, and paſte them on (with gum tragagant diſſolued in faire water;) then fill the bottom glaſſe 2 thirds with the water, and rarifie the ayre in the glaſſe F, G, ſo often untill you haue hit ſuch a degree as is moſt fitting for the temper of the weather, put in a little crooked hollow cane for the ayre to paſſe in and out at, but let it not touch the water: then ſtop it about the joynts of the glaſſe with good cement, that nothing may come out. Make an artificiall rock about it, with peeces of cork dipt in glew, and rowled in this following powder, and it is done.

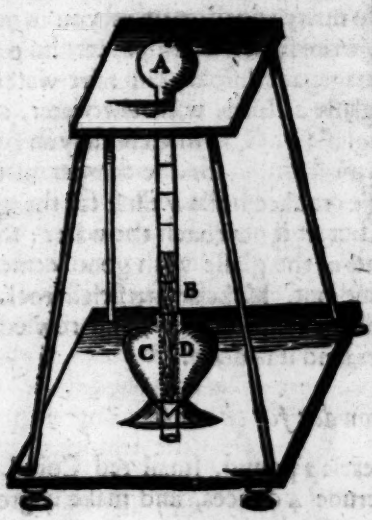
The powder for the rock.

Take mother of Pearle 2 pound, ſmall red Corall di. pound, Antimony crude 4 ounces, and make a groſſe powder of them.

To make the ſingle perpendicular glaſſe, aſcending with heat, and deſcending with cold.

PRepare two glaſſes after the faſhion of the figure A, B, and C, D: let the glaſſe A, B, haue a ſmall pinhole at or about the top of all, and let the glaſſe C, D, haue beſides the hole at the top, another hole at the bottom with a ſhort pipe. Prouide ſuch a frame for this as you did before for the other; then put the glaſſes into it, faſten the bottom glaſſe to the bottom of the frame, hauing a

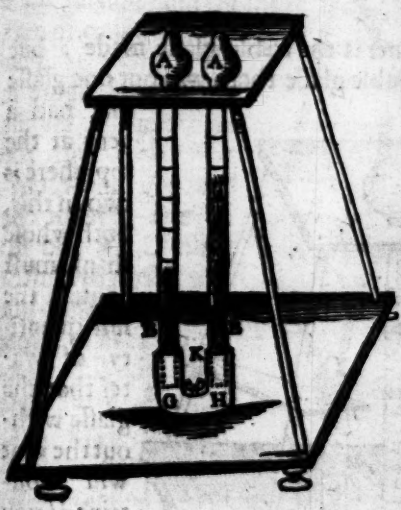
hole at the bottom, thorow which the pipe of the glaſſe C, D, may paſſe, fit a cork unto it: then lute the two glaſſes together, ſo that no ayre may paſſe between the joyning; divide then the ſhank into ſo many degrees as you pleaſe, and figure it as before I taught you, then with the heat of a candle, rarifie the ayre in the glaſſe C, D, and fill it a third part full of water, and then put the cork faſt in. Note that if the firſt heating of the glaſſe rayſe not the water unto your content, you muſt repeat it over and over, untill it doe: when it is ſufficient, then ſtop the cork in very firm, that no water may come out, and it is made.



How to make the double perpendicular glaſſe.

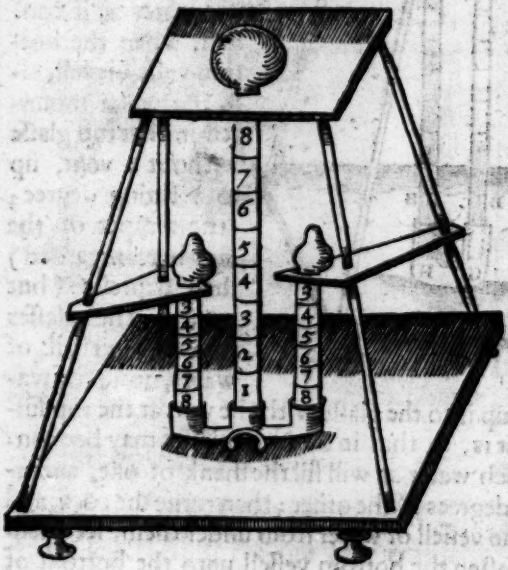
PRepare two glaſſes like unto the figure marked with the letters A, B, the one of them muſt have a ſmall hole in or about the head thereof. Prepare likewiſe for the bottom a veſſell of the faſhion of the figure G, H, having two mouthes, at each end one, alſo a cocke in the middle, as K: divide then the ſhank of the glaſſe without the

the hole in the top, into equall parts, and ſet figures upon it: next lute them both faſt into the necks of the bottom veſſell. (But firſt remember to put them in a frame:) when the cement is dry turn the cock of the bottom veſſell, and rarify the ayre in the glaſſe that hath no hole at the top; then ſet the bottom veſſell a little way into a veſſell filled with water, and it will ſuck up the the water as it cooleth, when the bottom veſſell is full, alſo the water mounted in that top glaſſe without a vent, up to a fitting degree; (the temper of the weather regarded) then depreſſe (but gently) the glaſſes into the veſſell of water, untill the water be come up into the glaſſe with the vent at the top ſufficiently, that is, ſo that in both the glaſſes may bee contained ſo much water as will fill the ſhank of one, and about 2 or 3 degrees of the other; then turne the cock, and take away the veſſell of water from under them, let them down, and faſten the bottom veſſell unto the bottom of the frame, and make a rock about it, or elſe what other works you pleaſe, that the art may not be diſcerned. Laſtly, ſet figures upon both, but firſt upon that without the



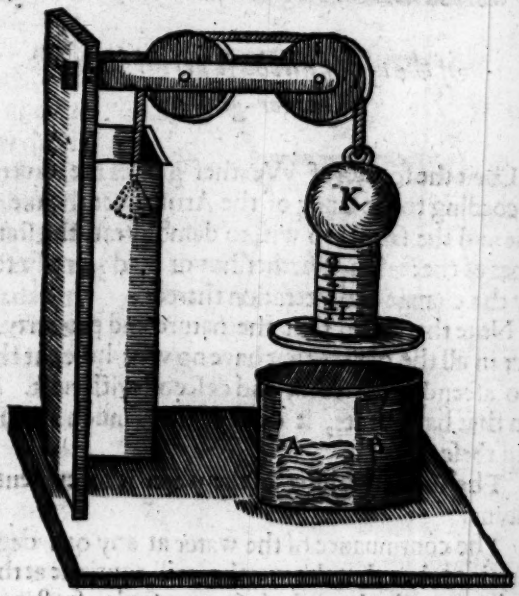
vent, beginning from the bottom, and proceeding upwards, then lay your hand upon the head of it, which will depresse the water, which when it commeth equall to the degrees, paste the same degree on the place of the water in the other glasse with the vent, and it is done.

AFter the same manner is the treble glasse made: but whereas in the double glasse there was but one glasse that had a vent at the top, there is two in this, both whose shanks must contain the iust quantity of water that the glasse without the vent will containe. If you do well obserue the form of the subsequent figure, you cannot goe amisse.



How to make the moueable perpendicular glaſſe.

FIrſt prepare the glaſſe A, B, fill it almoſt top-full of water, prouide alſo the glaſſe K, L, having a loop at the top of it: diuide it into ſo many equall parts as you



would haue degrees, and on the mouth thereof faſten a thin board, that will eaſily ſlip in and out of the bottom glaſſe, make then a waight of lead or braſſe ſomewhat

heavier than both the glaſſe and board faſtned thereto; and then tie a little rope to the loop of the glaſſe A, B, and the waight at the other end thereof. Rarify the ayre contained in the glaſſe L, and reverſe it into the glaſſe A, B, filled with water, and hang the plummet over two little pulleys faſtned in a frame made for the purpoſe, and as the glaſſe K, L, cooleth, the water will aſcend the ſame, and ſo by the change of the outward both the glaſſe and water will move accordingly.

Of the uſe of all the ſeverall ſorts of Weather-glaſſes.

ALbeit the formes of Weather-glaſſes are divers, according to the fancy of the Artiſt, yet the uſe of all is one and the ſame: to wit, to demonſtrate the ſtate, and temper of the ſeaſon, whether hot or cold; as alſo to foreſhew the change and alteration thereof.

1 Note therefore, that the nature and property of the water in all the glaſſes that have no vent holes at the top, is, to aſcend with cold, and deſcend with heat. But in them that have vents, it deſcendeth as much as it aſcendeth in theſe.

2 The ſudden falling of the water is an evident token of rayne.

3 The continuance of the water at any one degree, is a certaine token that the weather will continue at that ſtay it is then at, whether it be fayre, or foule, froſt or ſnow. But when the water either riſeth or falleth, the weather will then preſently change.

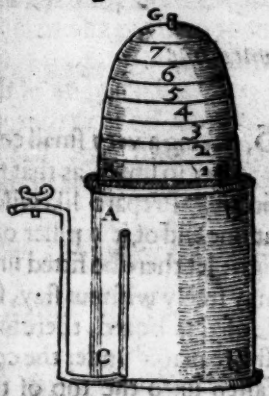
4 The uncertaine motion of the water is a ſigne of fickle weather. The

The ſingle perpendicular with a vent, moveth upwards with cold, and downwards with heat, and is quite contrary in quality to the former, only that it moveth uncertainly in fickle and uncertaine weather, and keepeth a conſtant place in ſtayed weather.

Theſe rules are all certaine and true: now you may according to your owne obſervation frame other rules, whereby you may foretell the change of the weather the water being at any one degree whatſoeuer.

A Water-clock, or a Glaſſe ſhewing the houre of the day.

LEt there be provided a deepe veſſell of earth, or any thing elſe, that will hold water, as A, B, C, D, provide alſo a glaſſe made after the faſhion of the figure marked with the letters E, F, G. It muſt bee open at the bottom, and haue alſo a ſmall hole at the top, thorow which if you can but put the point of a needle, it is ſufficient. This glaſſe muſt not bee ſo long as the veſſell is deepe, by about two inches. Then take a iuſt meaſure of the length of the glaſſe K, G, G, and ſet it on the inſide of the veſſell A, B, C, D, from the bottom towards the top, and then make a raſe round about the veſſell; there muſt bee fitted unto this



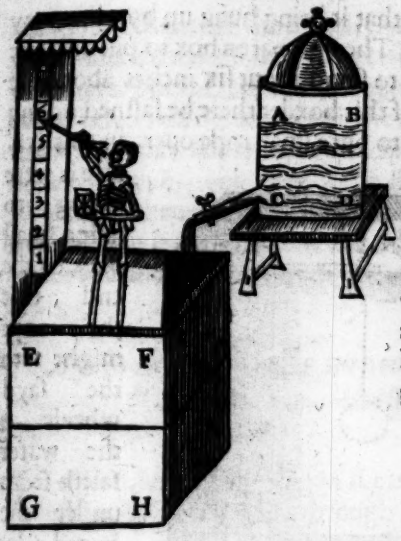
earthen

earthen vessell, a pipe reaching from the top of the outside thereof, (where there must bee a cock unto it) and going to the bottom, where it entreth the same, and againe extendeth it selfe almost unto the circle or mark raised on the vessell A, B, C, D. Fill then the vessell with fayre water up to the raise, or circle, and turne the cock, and put the glasse into the water, and you shall see that the glasse by reason of its heavinesse, will tend toward the bottom of the vessell, but very slowly, by reason that the ayre contained therein hath so small a vent: turne an houre-glasse, and at the end of each houre make a mark upon the glasse equall with the water, and it is done. When the glasse is quite sunke to the bottom of the water, turn the cock, and with one blast of your mouth at the pipe, it will ascend againe.

Another fashioned one.

PRepare a vessell, as A, B, C, D, having a very small cock unto it, whose passage ought to bee so small, as that the water might issue out but by drops. Prepare likewise a vessell, as E, F, G, H, having at one end of it a piller of a foot and a halfe, or two foot high: let there be fitted unto this vessell a board, so that it may freely without stay, slip up and down: towards one side of this board, there must be a good big hole, which must bee placed under the cock of the other vessell. Then fasten unto the top of this board, the image of Time or Death, and pointing with a dart upon the piller aforesaid: turne then an houre-glasse, and at the end of every houre, make a figure on the place

of

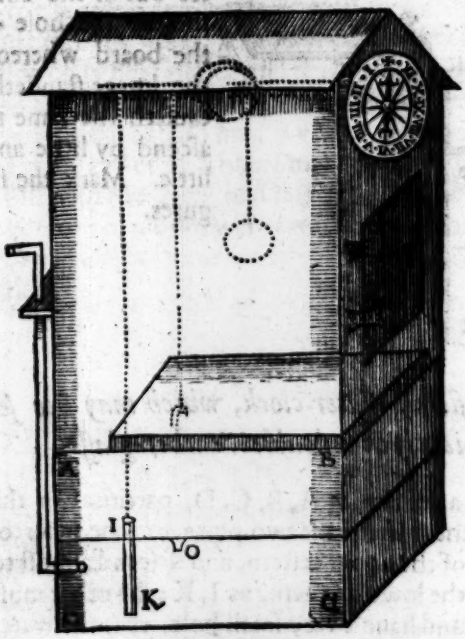


of the piller that the image with his dart pointeth at, and it is made. For note, the dropping of the water out of the cock thorow the hole of the board whereon the image ſtandeth, cauſeth the ſame to aſcend by little and little. Mark the figures.

Another artificiall Water-clock, which may bee ſet conveniently in a double Weather-glaſſe.

FIrſt prepare a ceſtern, as A, B, C, D, partition in the middle, let there bee made two pipes, the one whereof muſt reach out of the upper ceſtern, and deſcend almoſt to the bottom of the loweſt ceſtern, as I, K; the other muſt be a ſhort one, and haue a very ſmall hole, that the water may thereby iſſue out of the upper ceſtern but by drops; alſo at the ſide nigh the bottom of the upper ceſtern, let a ſmall pipe enter. To the upper ceſtern fit a board, (with a peece of lead nayled upon it to make it ſomewhat heavy) ſo that it may eaſily ſlip up and downe in it; this board muſt haue a loop to faſten a rope unto, and you muſt ſo

poyse the said board, that it being hung up by a line, may hang even, and levell. Then prepare a box to put ouer the cestern, which ought to stand about six inches aboue the cestern. In the top of this box let there be fastned a long pulley with a creuice to put a small rope ouer, in this creuice it were fitting to fasten small pins, to the end that the rope might turn the sayd wheele as the water faleth from under the board: let the spindle of this pulley come out at one side of the box whereon there is a Dyall drawn, containing so many houres as you would haue it go for; unto this end of the spindle let there bee fitted a needle, or director, to shew the houre, then put a small cord ouer the pulley in the box, fasten one end thereof to the loop of the board, and at the other end let there bee tied a waight not



not quite ſo heauy as the board, then fill the upper ceſtern with water, and the board will preſſe it out into the lower veſſell, at the pipe O, drop by drop, and as the board ſinketh lower, it will by meanes of the rope upon the pulley, turne the index faſtned unto the ſpindle of the pulley about the dyall; you may ſee it by an houre-glaſſe or Watch: when it is quite downe, if you doe with your mouth blow into the pipe at the ſide of the ceſtern, the water will all mount up againe into the upper ceſtern.

A wheele which being turned about, it caſteth water out at the ſpindle.

LEt A, B, be a tub hauing in the bottom a braſſe barrell, with a hole open quite through one ſide of it: let D, E, F, be a wheele, whoſe ſpindle muſt bee alſo hollow, and haue a hole through one ſide of it, ſo that being put into the hollow barrell, both the holes may be equall together. Note then, that ſo long as theſe holes are equall together, the water will run out at the ſpindle of the tub, but if you turne the wheele to another ſide, it will not run.

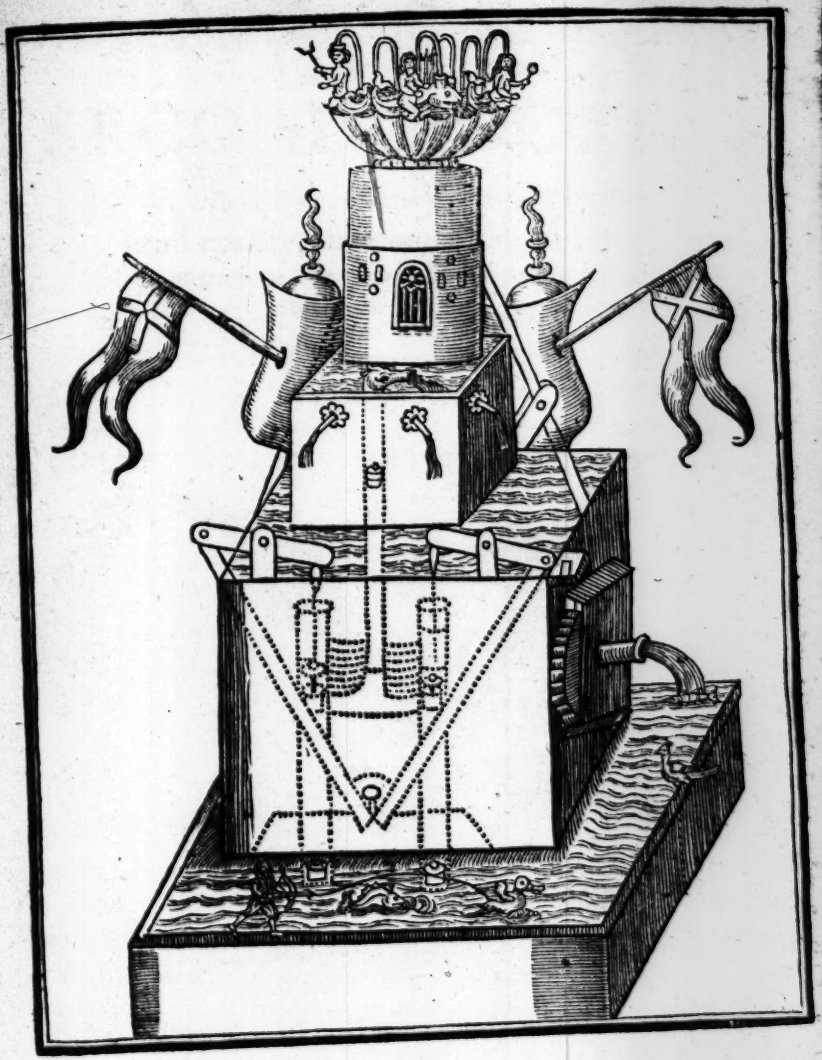
A water-presser, or the mounting of water by compression.

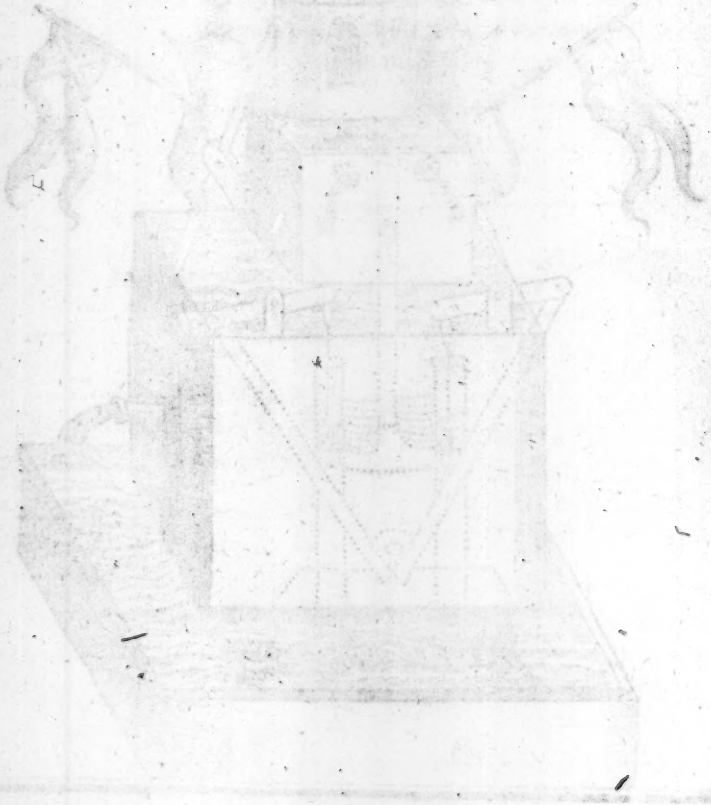
LEt there bee prouided a barrell of brasse, of what length and wideneſſe you pleaſe, let it bee exactly ſmooth within, and very tight at bottom; unto this barrell fit a plug of wood leathered about, and let there bee made diuers ſmall holes quite through it, wherein faſten diuers formes and ſhapes of birds, beaſts, or fiſhes, hauing very ſmall pin-holes through them, for the water to ſpin out at: you ſhall do well to make this plug very heavy, either by pouring molten lead into certaine holes made for the purpoſe, or elſe by faſtning ſome waight unto the top: fill the barrell with water, and put the plug into it, which lying ſo heavy upon the water, it will make it ſpin out at the pin-holes of the images placed thereupon.

How to compoſe a great or little peece of Water-worke.

FIrſt prepare a table, whereupon erect a ſtrong frame, and round about the frame make a moat with a leaden ceſtern to be filled with water; let the leaden moat ſomewhat undermine as it were the frame, which ought to be built in three ſtories, one aboue another, and euery one leſſer than another. Within the middle ſtory faſten a very ſtrong Iack that goeth with a waight, or a ſtrong ſpring, the ending of whoſe ſpindles ought to be crooked, thus Z, whereby diuers ſweeps for pumps may bee moued to and againe, whoſe pumps muſt go down into the moat, and haue ſmall ſuccurs unto them, and convayances towards their tops, whereat the water may be mounted into diuers ceſterns, out of ſome wherof there may be made convayances in their bottoms, by ſmall pipes running down into the riuer or moat again, and there breaking out in the faſhions and formes of Dragons, Swans, Whales, Flowers, and ſuch like pretty conceits: out of others the water may fall upon wheeles, out of whoſe ſpindles, the water turning round, may bee made to run. In the uppermoſt ſtory of all, let there bee made the forcer by ayre, as I taught before, or elſe a preſſer, hauing at the top, Neptune riding on a Whale, out of whoſe noſtrils, as alſo out of Neptunes Trident, the water may be made to ſpin through ſmall pin-holes; you may alſo make diuers motions about this work, but for that the multitude of figures would rather confound than inſtruct the Reader, I haue of purpoſe omitted them.

How to complete a great or little piece of Water-work.





THE SECOND BOOKE,

Teaching moſt plainly, and withall moſt exactly, the compoſing of all manner of Fire-works for Triumph and Recreation.

By *I. B.*

LONDON,
Printed by *Thomas Harper* for *Ralph Mab*. 1634.

To the Reader.

COurteous Reader, there hath a deſſiance been occaſioned ſince the inception of this work, by reaſon of the occurrence of certaine Authours, that contrary unto my knowledge had laboured ſo fully herein; but after conſideration had (that for the moſt part they were but tranſlations) I thought it might bee no leſſe lawfull and commendable for mee than for others, to communicate unto ſuch as are yet deſirous of further information, that wherein I haue beſtowed both coſt and paines. Notwithſtanding, I haue ſo uſed the matter, as that I might not derogate from the eſtimation had of others to increaſe mine owne. Read it throughly, iudge indifferently, and if thou likeſt it, practiſe conſiderately. If thou art ignorant herein, I am

sure it will instruct thee, and though well experienced (which perhaps thou art) I make no question, but that thou mayst finde somewhat which thou hast not heard of before; So farewell.

Your Wellwiller

I. B.

Of Fire-workes.

I Haue euer found (in conference with diuers desirous of instruction in any Art or Science whatsoeuer) that the summe and chiefest end of all hath been, to know the reasons and causes of those things they were desirous to be informed in. Wherefore I thought good, before I came to the matter it selfe, to set down some few Præcognita or Principles (as I may so call them) whereby such as are ingenious, upon occasion, may informe themselues, if they stand in doubt of the cause of any thing that is hereafter taught.

Certayne Præcognita or Principles, wherein are contayned the causes and reasons of that which is taught in this Booke.

1 THe foure Elements, Fire, Ayre, Earth, and Water, are the *prima principia* (I meane the materialls) whereof euery sublunary body is compoſed, and into the which it is at last dissolued.

2 Euery thing finding a dissolution of those *naturæ tacitæ*, that is, meanes whereby their *principia* are connected, and ioyned together, their lighter parts ascend upward,

ward, and those that are more grosse and heauy, doe the contrary.

3 It is impossible for one and the selfe same body to possesse at one time two places; It followeth therefore, that a dense body rarified, and made thin, eyther by actuall or potentiall fire, requireth a greater quantity of room to be conteyned in, then it did before. Hence it is, that if you lay your hand upon a glasse, hauing a straight mouth reuerst into a dish of water, it rarifieth the ayre contayned therein, and makes it breake out thorough the water in bubbles. Also, that gunpowder inclosed in the barrell of a gun, being rarified by fire, applied unto the touch-hole, it seeketh a greater quantity of roome, and therefore forceth the bullet out of the barrell. This is called violent motion.

4 According unto the strength and quantity of a dense body rarified, and according unto the forme and length of its inclosure, it forceth its compreller further or neerer at hand.

Thus much shall suffice to haue spoken concerning the *Præcognita*: Now I will passe *ad majora, & ad magis necessaria*: to wit, those necessary Instruments, and seuerall sorts of Ingredients, that ought to be had in readines.

As for the instruments they are these; Morters and Pestles, Serces, also seuerall sorts of Formers, Paper, Parchment, Canuas, Whipcord, strong binding thread, Glew, Rosin, Pitch, with diuers vessells meet to contayne and mingle your compositions in. The ingredients likewise are chiefly these, Saltpeter, Rochpeter, Sulpher, Charcoale, good Gunpowder, Filings of steele, oyle of Peter, and Spirit of wine.

Instructions

Instructions for chusing your ingredients.

SAltpeter is very good, if that being layd upon a board, and fire put to, it rise with a flamed ventosous exhalation, raysing no scum, nor leauing no pearle, but onely a blacke specke burnt into the boord.

The best brimstone, is quick brimstone, or liue sulphur, and that sort is best that breaketh whitest; if this cannot be gotten, take of the whitest yellow brimstone.

The best Coales for use are the sallow, willow, hazel and beech; onely see they be well burnt. Euery of these ingredients must be powdred finely and searsed.

All kindes of gunpowder are made of these ingredients imposed, or incorporated with vinegar, or aqua vitæ, and afterward grayned by art: The Saltpeter is the Soul, the Sulphur the Life, and the Coales the Body of it. The best sort of powder may be distinguished from others, by these signes:

1 If it be bright and incline to a blewish colour.

2 If in the handling it proue not moyst but auoydeth quickely.

3 If being fired, it flash quickly, and leaue no dregs nor setlings behinde it.

A deuice to try the strength of diuers sorts of Gunpowder.

IF so be you haue at any time diuers sorte of Gunpowder, and it is your desire to know which of them is the strongest, then you must prepare a box, as A, B, being foure inches high, and about two inches wide, hauing a lid

lid ioynted unto it. The box ought to be made of iron, braſſe, or copper, and to bee faſtned unto a good thick plank, and to haue a touch-hole at the bottom, as O, and that end of the box where the hinge of the lid is, there muſt ſtand up from the box a peece of iron or braſſe, in length anſwerable unto the lid of the box: this peece of iron muſt haue a hole quite through it, towards the top, and a ſpring, as, A, G, muſt bee ſcrewed or riueted, ſo that the one end may couer the ſayd hole. On the top of all this iron, or braſſe that ſtandeth up from the box, there muſt bee ioynted a peece of iron (made as you ſee in the figure) the hinder part of which is bent downward, and entreth the hole that the ſpring coureth; the other part reſteth upon the lid of the box. Open this box lid, and put in a quantity of powder, and then ſhut the lid down, and put fire to the touch-hole at the bottom, and the powder in the box being fired, will blow the box lid up the notches more or leſſe, according as the ſtrength of the powder is: ſo by firing the ſame quantity of diuers kindes of powders at ſeuerall times, you may know which is the ſtrongeſt. Now perhaps it will bee expected that I ſhould ſpeak of the making of Saltpeter, Gunpowder, Coales, with the refining of Sulphur: but becauſe they are ſo commonly to bee had, and to bee bought at better rates than I know they can bee made by any that intend it for their priuate uſe, I haue forborne it: There are diuers I am ſure that would willingly bee in

action:

action: I haue thought fitting therefore to ſet downe the collection of naturall Salpeter, which is a kinde of white excreſcence growing upon ſtone-wals, and (as I haue ſeene great ſtore) in the arches of ſtone-bridges. Firſt therefore gather this white excreſcence, and adde unto it Quick-lyme, and Aſhes, mingle them, and put them into a halfe-tub that hath a hole to draw the liquor out at; then put into this halfe-tub warm water, and let it ſtand untill all the peter be diſſolued; let it then drain out at the hole by little and little, and if the liquor be not cleere, double a brown paper, and put it within a tunnell, and ſtraine the liquor through it. Then boyle it and ſcum it untill it bee ready to congeale, neither too hard, nor yet too tender: then take it from the fire, and put it into ſhallow veſſels, either of earth or braſſe; ſet them in a cold place two or three dayes, and it will ſhoot into iſicles, and this is called Rochpeter. Thus much for the ingredients. Now I am come unto the Formers, the number whereof I cannot certainly determine, becauſe it dependeth upon the variety of each particular perſons inuention. Now that I may formally proceed, I will firſt make ſome diſtinction of each kinde in generall; and then I will ſpeak of euery particular contained in each generall. Fire-works are of 3 ſorts.

1 Such as operate in the ayre, as Rockets, Serpents, Raining fire, Stars, Petards, Dragons, Fire-drakes, Feinds, Gyronels, or Fire-wheeles, Balloons.

2 Such as operate upon the earth, as Crackers, Trunks, Lanterns, Lights, Tumbling bals, Sauciſſons, Towers, Caſtles, Pyramids, Clubs, Lances, Targets.

3 Such as burn in or on the water, as Rockets, Dolphins, Ships, Tumbling bals.

Part of either of the three kindes are ſimple, and part are compounded; part alſo are fixed, and part moueable. Firſt I will treat of the diuers compoſitions, and then of the Formers, Coffins, and manner of compoſing euery of them.

Of the diuers compoſitions of fire workes.

FIrſt of the compoſitions of fire workes, for the ayre; and therein firſt I will ſpeake of the compoſitions for rockets, becauſe that all moueable fireworkes haue their motion from the force of them accordingly applied.

Compoſitions for Rockets of all ſizes, according unto the preſcription of the noted Profeſſors, as Mr Malthus, *Mr* Norton, *and the French Authour,* Des recreationes Mathematiques.

A Compoſition for Rockets of one ounce.

TAke of gunpowder, ſaltpeter and charcoale, of each one ounce and a halfe, mingle them together, and it is done. Note heere, as I told you before, that all your ingredients ought to be firſt powdred by themſelues, and afterwards mixed very well together.

A

A Compoſition for Rockets of two and three ounces.

TAke of gunpowder fowre ounces and a halfe, ſaltpeter one ounce, mixe them together.

A Compoſition for Rockets of foure ounces.

TAke of gunpowder fowre pounds, ſaltpeter one pound, charcoale fowre ounces, mingle them together.

A Compoſition for Rockets of fowre ounces.

TAke of gunpowder fowre poundes, ſaltpeter one pound, charcoale fowre ounces, brimſtone halfe an ounce, mingle them together.

A Compoſition for all middle fixed Rockets.

TAke of gunpowder one pound, two ounces of charcoales, mingle them.

A Compoſition for Rockets of five or ſix ounces.

TAke of gunpowder two pound fiue ounces, of ſaltpeter halfe a pound, of charcoale ſix ounces, of brimſtone and yron ſcales, of each two ounces, mingle them.

A Compoſition for Rockets often or twelve ounces.

TAke of gunpowder one pound and one ounce, ſaltpeter fowre ounces, brimſtone three ounces and a halfe, charcoale one ounce, mingle them.

A Compoſition for Rockets of one pound, or two.

TAke of ſaltpeter twelue ounces, gunpowder twenty ounces, and charcoale three ounces, quicke brimſtone and ſcales of yron, of each one ounce, mingle them.

A Compoſition for Rockets of eight, nine and tenne pounds.

TAke ſaltpeter eight pounds, charcoale two pounds twelue ounces, brimſtone one pound fowre ounces. Note that no practitioner (how exact ſoeuer) ought to relie upon a receipt, but firſt to trie one rocket, and if that be too weake adde more gunpowder, if it be too ſtrong let him adde more charcoale untill hee finde them flie according unto his deſire. Note that the charcoale is only to mitigate the violence of the powder, and to make the tayle of the rocket appeare more beautifull. Note alſo that the ſmaller the rockets be, they need the quicker receipts, and that in great rockets, there needeth not any gunpowder at all.

The Compoſition for middle ſized Rockets may ſerve for Serpents, and for rayning fire, or elſe the receipt for Rockets on the ground, which followeth heereafter.

Compoſitions for Starres.

TAke ſaltpeter one pound, brimſtone halfe a pound, gunpowder fowre ounces, this muſt be bound up in paper or little ragges, and afterwards primed.

Another receipt for Starres.

TAke of ſaltpeter one pound, gunpowder and brimſton of each halfe a pound; theſe muſt be mixed together, and of them make a paſte, with a ſufficient quantity of oile of peter, or elſe of fayre water; of this paſte you ſhall make little balles, and roll them in drie gunpowder duſt; then drie them, and keepe them for your occaſions.

Another.

Take a quarter of a pinte of *aqua vitæ*, and diſſolue therein one ounce, and a halfe of camphire, and dip therin cotten bumbaſt, and afterwards roule it up into little balles; afterwards rowle them in powder of quick brimſtone, and reſerue them for uſe.

Another receipt for Starres, whereof you may make fiends and divers apparitions according unto your fancie.

Take gum dragant, put it into an yron pan, and roſt it in the embers; then powder it, and diſſolve it afterwards in *aqua vitæ*, and it will become a jellie, then ſtraine it; diſſolve alſo camphire in other *aqua vitæ*. Mixe both theſe diſſolutions together, and ſprinkle therein this following powder.

Take ſaltpeter one pound, brimſtone halfe a pound, gunpowder three pound, charcoale halfe a pound; when you have mingled and ſtirred them well together, mixe them well with the aforeſayd jelly, and then make it into little balles, or into what faſhion elſe you pleaſe, then cool them in gunpowder duſt, and keepe them for uſe.

Compoſitions for receipts of fireworkes, that operate upon the earth.

FOr Rockets there needeth onely gunpowder finely beaten and ſearced.

Likewiſe for all the other ſorts, ſearced gunpowder will ſerue, which may be abated, or alayed with charcoal duſt at your pleaſure.

Compoſitions for fireworkes that burne upon, or in the water.

A Receipt for Rockets that burne upon the water.

TAke of ſaltpeter one pound, brimſtone halfe a pound, gunpowder halfe a pound, charcoales two ounces. This compoſition will make the Rockets appeare with a great fiery tayle. If you deſire to have it burne cleare, then take of ſaltpeter one pound, three ounces of gunnepowder, brimſtone halfe a pound.

A Receipt of a compoſition that will burne, and feed upon the water.

TAke maſticke halfe a pound, white Frankincenſe, gumſandrake, quicklime, brimſtone, bitumen, camphire, and gunpowder, of each one pound and a halfe, roſin one pound, ſaltpeter fowre pounds and a halfe, mixe them all together.

A Receipt of a compoſition that will burne under water.

Take brimſtone one pound, gunpowder nine ounces, refined ſaltpeter one pound and a halfe, camphire beaten with Sulphur, and Quickſilver; mixe them well together with oyle of peter, or linſeed oyle boyled, untill it will ſcald a feather. Fill a canvas ball with this compoſition, arme it, and ballaſt it with lead at the bottome, make the vent at the top, fire it well and caſt it into the water, and it will fume and boyle up ſlowly.

A Receipt of a Compoſition that will kindle with the water.

Take of oyle of Tile one pound, Linſeed oyle three pounds, oyle of the yelks of egges one pound, new quick lime eight pounds, brimſtone two pounds, camphire fowr ounces, bitumen two ounces; mingle all together.

Another.

Take of Roch peter one pound, flowre of brimſtone nine ounces, coales of rotten wood ſix ounces, camphire one ounce and a halfe, oyle of egges, and oyle of Tile enough to make the mixture into a paſte.

Or take callamita one pound, ſal niter and aſphaltum, of each fowre ounces, quicke brimſtone three ounces, liquid varniſh ſixe ounces; make them all into a paſte. Put eyther of theſe compoſitions into a pot wherein is quick lime, ſo that the lime come round about the paſt; then lute it faſt, binde it cloſe with wires, and ſet it in a limekill a whole baking time, and it will become a ſtone that any moyſture will kindle.

If you make a little hole in the top of an egge, and let out all the meat, and fill the ſhell with the following powder,

powder, and ſtop the hole with wax, and caſt it into a running water, it will break out into a fire.

Take of ſalt-niter, brimſtone, and quick-lyme, of each a like quantity, mix them.

How to make ſtouple, or prepare cotten-week to prime your fire-works with.

Take cotten-week, ſuch as the Chandlers uſe for candles, double it ſix or ſeuen times double, and wet it throughly in ſaltpeter water, or aqua vitæ, wherein ſome camphire hath been diſſolued, or, for want of either, in faire water; cut it into diuers peeces, rowle it in mealed gunpowder, or powder and ſulphur; then dry them in the Sun, and reſerue them in a box where they may lie ſtraight, to prime Starres, Rockets, or any other fire-works.

How to know the true time, that any quantity of fired Gun-match that shall doe an exployt at a time desired.

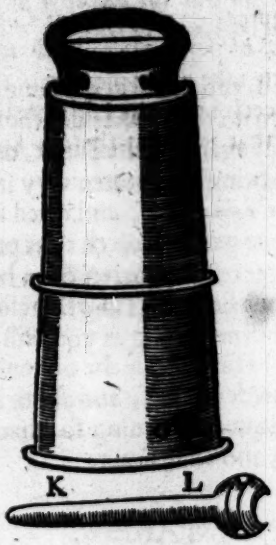
TAke common gun-match, rub, or beat the same a little against a post to soften it; then either dip the same in salt peter water, and drie it againe in the Sunne, or else rub it in a little powder and brimstone beaten very small, and made liquid with a little *aqua vitæ*, and dried afterwards; trie first how long one yard of match thus prepared will burne, which suppose to be a quarter of an howr, then fowre yards will be a iust howre. Take therefore as much of this match as will burne so long as you will haue it to be ere your worke should fire, binde the one end unto your worke, lay loose powder under, and about it lay the rest of the match in hollow, or turning so that one part of it touch not another, and then fire it.

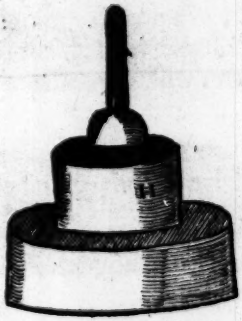
A Water called Aqua Ardens.

TAke old red wine, put it into a glased vessell, and put into it of orpment one pound, quicke sulphur halfe a pound, quicke lime a quarter of a pound; mingle them very well, and afterwards distill them in a rosewater still: a cloth being wet in this water will burne like a candle, and will not be quenched with water.

The Formers are instruments wherewith the coffins for the fireworkes are made and formed, whereof in order; and first for Rockets that operate in the ayre. The Formers for Rockets consist of two parts, represented by the two next figures following, the uppermost whereof

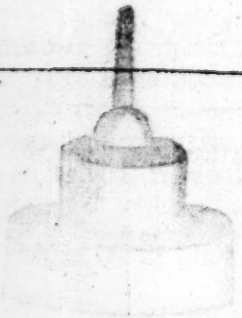
repre-



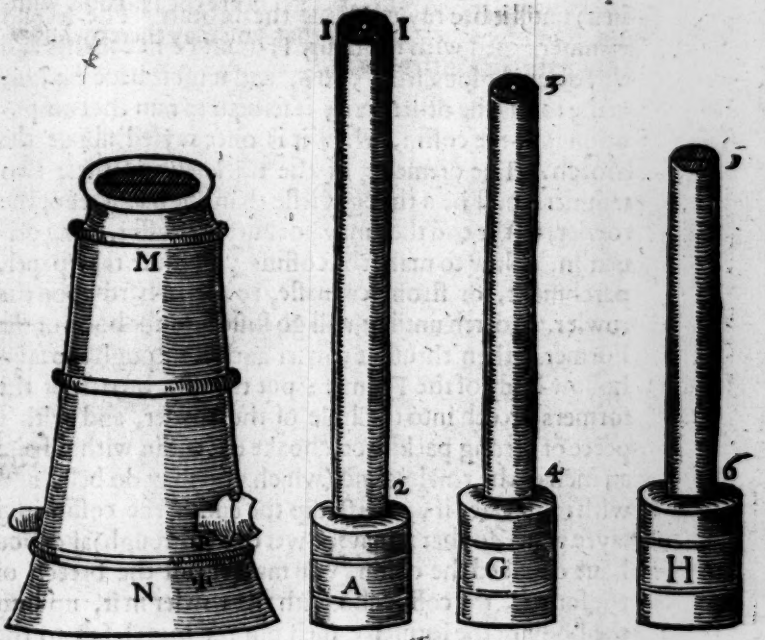


repreſenteth the body of the Former, which muſt bee made of Maple, Walnut tree, or of other cloſe & well ſeaſoned wood, ſeven inches, wanting halfe a quarter in length, turned equally, and exactly hollow quite through, the diameter of whoſe hollowneſſe, repreſented by the line at the top marked at each end with a, c, muſt bee one inch and a quarter; the breech of the former is repreſented by the loweſt figure, the upper part wherof, muſt be made to enter the body of the Former; the height of the whole breech, beſide the broach is 3 inches and a halfe; it entreth the body of the Former, one inch and three quarters; the top of it muſt be made like a halfe nutmeg, in the midſt whereof (as

Mr. *Malthus* and *des recreationes Mathematiques*) there must bee fastned an yron broach two inches and a halfe long: then put the breech into the body, and pierce them both quite through as the figures doe represent at G and H; then make a pin as K, L, to pinne them both together, which must bee made to take out at pleasure: then marke both the body and breech neere the said hole with this * or any other marke, that you may thereby know how to fit them afterwards.



The next figure marked with M, N, doeth expreſſe both the parts of the Former pinned together; unto this Former there muſt be made one Rowler expreſſed by the figure A; alſo two rammers expreſſed by the figures G H; they muſt all of them be turned very even and ſmooth;



let the diameter of the thickneſſe of the rowler expreſſed by the line on the top marked I I, be three quarters of an inch, let it be eight inches long from I, to 2, and have a hole bored in the very midſt of the end, ſo wide and ſo

deep, that all the broach of the former may enter the ſame: this is to rowle the coffin of paper and upon. The firſt rammer noted with the figure G, muſt bee ſeuen inches and a halfe long, from 3 to 4, and haue a hole at the end of it, as the rowler had; this rammer is to ram the compoſition into the former (hauing the coffin in it) untill it bee rayſed aboue the broach. The ſecond rammer noted with the figure H, muſt be fiue inches and three quarter long from 5 to 6, and it muſt haue no hole at the top as the other had; it ſerueth to ram the compoſition into the coffin, when it is once rayſed aboue the broach. The diameter of the thickneſſe of theſe two rammers muſt be a thought leſſe than the diameter of the rowler, to the end they may not hurt the coffin, being driuen in. Now to make the coffins you muſt take paper, parchment, or ſtrong canuaſſe, rowle it hard upon the rowler, ſo often untill it will go ſtiffe into the body of the Former: then thruſt it rowler and all through the ſayd hollow body of the Former; put then the broach of the formers breech into the hole of the rowler, and with a peece of ſtrong packthred choake the coffin within halfe an inch of the rowlers end (which you may do beſt, and with moſt eaſe, if you firſt dip the end of the coffin into fayre water, ſo that it may be wet quite through) after you haue choaked the coffin, you muſt thruſt the breech of the former, the coffin alſo with the rowler in it, up into the body of the former: then pin the breech faſt to the body of the former with the pin, and on the rowler giue one ſtroak or two with a mallet lightly, then unpin the breech, and with the rowler thruſt the coffin out of the bottom of the former, lay it by untill the end be dry. Thus you may at leiſure times make diuers coffins ready

to

to uſe upon any occaſion. The following figure expreſſeth an empty coffin.

Take one of theſe coffins, put it into the Former, and take the compoſition for middle-ſized rockets (mentioned before) and put thereof ſpoonfull after ſpoonfull, untill you haue filled the coffin unto the top of the former, after the putting of euery ſecond ſpoonfull into the coffin, with a mallet giue two or three blowes upon the head of the rammer, that the compoſition may bee well rammed into the coffin: euery third or fourth driuing M. *Norton* wiſheth (if the rockets are to be fired in three or foure dayes) to dip the rammer in gum-dragant, and camphir diſſolued in ſpirit of wine, or good *aquavitæ*: but if it will bee a month before they will bee fired, then dip the rammer in oyle of peter, or liquid varniſh, and linſeed oyle mixed together: If you would haue the rocket to giue a report or blow, then within one diameter of the top, driue a bottom of leather, or ſix or eight double of paper, pierce and prime either of them through in three or foure places, and fill the reſt of the coffin with whole gunpowder; afterwards driue another bottom of leather, and then with ſtrong packthred choak the coffin cloſe unto it: then take the rocket out of the Former, and prime

it

it at the broach-hole with a peece of prepared ſtouple, and binde unto it a ſtraight rod 6 or 7 times the length of the rocket, and ſo heavy, that being put on your finger, it may ballaſt the rocket within two or three diameters of the ſame: mark the following figure, which repreſents a rocket ready made and finiſhed, A, B, the rocket, C, the ſtouple that primeth it, D, E, F, the rod bound unto the rocket with two ſtrings, G, H, I, the hand that poyſeth it.

How to make Serpents.

THe coffins for ſerpents are made of paper rowled nine or ten times upon a rowler not much thicker than a gooſe quill, and about foure inches long. The coffins muſt bee choaked almoſt in the midſt, but ſo that there may bee a little hole, through which one may ſee: the longeſt part of the coffins for Serpents muſt be filled with the compoſition ſpecified before: if you would haue it wamble in the ayre, then choak it not after the compoſition, but if you would haue it wamble, then halfe-choak it, as is demonſtrated by the following figure, the ſhorter end of the coffin muſt bee filled with whole gunpow-

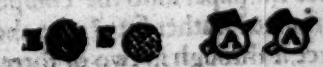
der,

der, and choaked quite up, as appeareth at B, in the figure M, N, O, which is the figure of a Serpent ready made.

How to make rayning fire.

TAke diuers gooſe quils, and cut off the hollow ends of them, and fill them with the compoſition before mentioned, ſtopping them afterwards with a little wet gunpowder, that the dry compoſition may not fall out.

How to make ſtarres.

I Haue ſufficiently taught the making of theſe in deſcribing their compoſitions, wherefore I will now onely preſent the figures of them unto your view;  A, A, ſignifieth two that are bound up in paper or cloth, and peirced, and primed with ſtouple: the other two, E, E, ſignifie thoſe that are made up without paper, and need no priming more than the powder or ſulphur duſt that they are rowled in.

How to make Petards.

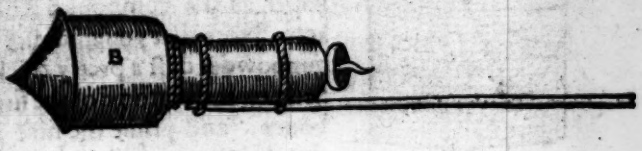
YOu muſt make the coffins for them either of white yron, or elſe of paper, or parchment rowled upon a

Former for the purpose, and afterwards fitted with a couer, which must be glewed on: these coffins must be filled with whole gunpowder, and peirced in the midst of the broad end, and primed thereat with prepared stouple; the paper ones must be couered all ouer with glew, and the peirced. The figure of a Petard ready made, and primed, is signified by the figure E.

How to make compounded Rockets.

First you must make the Rocket I taught you before; you must not choake the end of it, but eyther double downe halfe the coffin, and with the rammer and a mallet, give it one or two good blowes: then with a bodkin pierce the paper unto the composition, or else drive a bottome of leather fitted unto the bore of the Rocket, and pierce it through in two or three places; then pare or cut off the coffin equall thereunto; to this end of the rocket you must binde a coffin wider a great deale then the Rocket is; strew into it a little gunpowder dust, that it may cover the bottome of this coffin, and put therein with their mouthes downeward eyther golden rayne, or serpents, or both; also starres, or petards; you must put some gunpowder dust among these; when you have filled the coffin with these or such like, cover the top of it with a peece of paper, and paste upon that a picked crowned paper,

paper, balast it with a rod, and it is finished; the figure followeth.

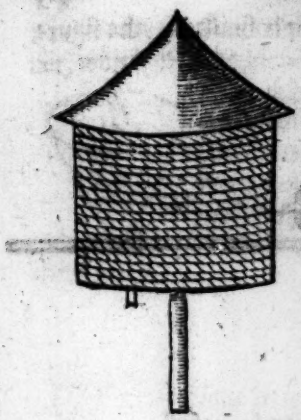


How to make fiends, or fearefull apparitions.

THese must bee made of the compositions for Starres, wrought upon cotton weeke dipped in *aqua vitæ*, wherein camphire hath beene dissolved, and after what fashions your fancy doth most affect.

How to make fire Boxes.

YOu must make the coffins for fire Boxes of paste-board, rowled upon a Former, of what bignesse you list; then binde them about with packthread, and glew over the cords; also glew bottoms unto them, which must be piereed with a bodkin to prime them at. In these boxes

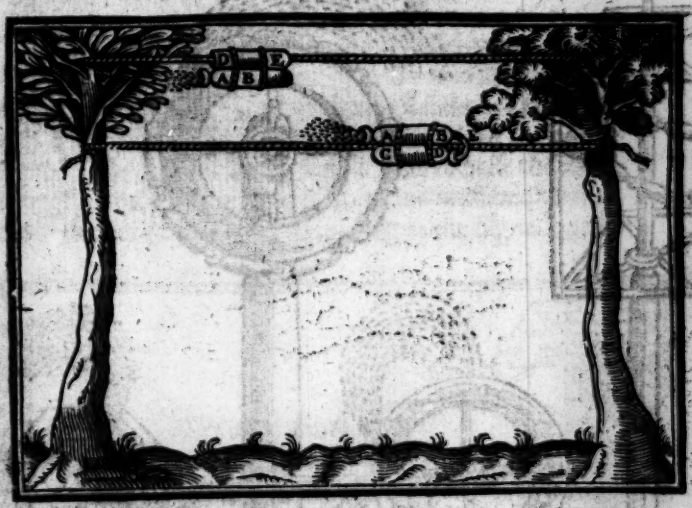


xes you may put golden rayne, ſtarres, ſerpents, petrars, fiends, devils. The tops of theſe fire boxes muſt bee covered with paper as the compound Rockets. Note that you muſt ſtrew gunpowder duſt a pretty thickneſſe on the bottome of the fire-boxes, and prime the hole at the bottome with prepared ſtouple.

How to make Swevels.

SWevels are nothing elſe but Rockets, having inſtead of a rod (to ballaſt them) a little cane bound faſt unto them, where through the rope paſſeth. Note that you muſt be carefull to have your line ſtrong, even & ſmooth, and it muſt be rubd over with ſope that it may not burn. If you would have your Rockets to returne againe, then binde two Rockets together, with the breech of one towards the mouth of the other, and let the ſtouple that primeth the one, enter the breech of the other; both kinds are expreſſed by the figures, the uppermoſt whereof repreſenteth the ſingle one; A B ſignifieth the Rocket; D E, the cane bound unto it, through which a rope paſſeth. The lowermoſt repreſenteth the double Rocket; A B ſignifieth

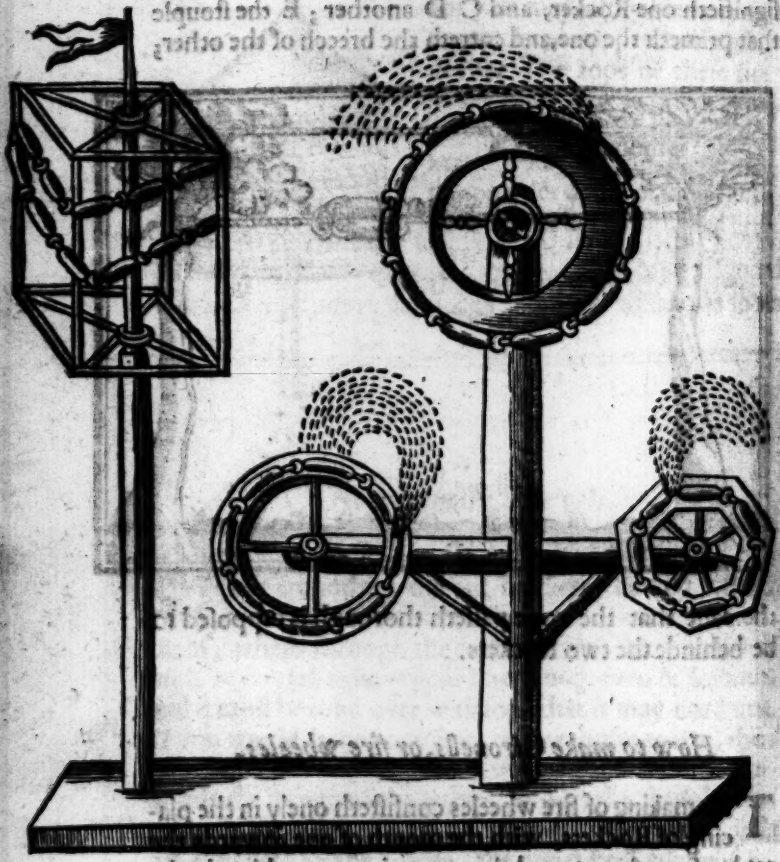
ſignifieth one Rocket, and C D another; E the ſtouple that primeth the one, and entreth the breech of the other;



the cane that the rope paſſeth thorough is ſuppoſed to be behinde the two Rockets.

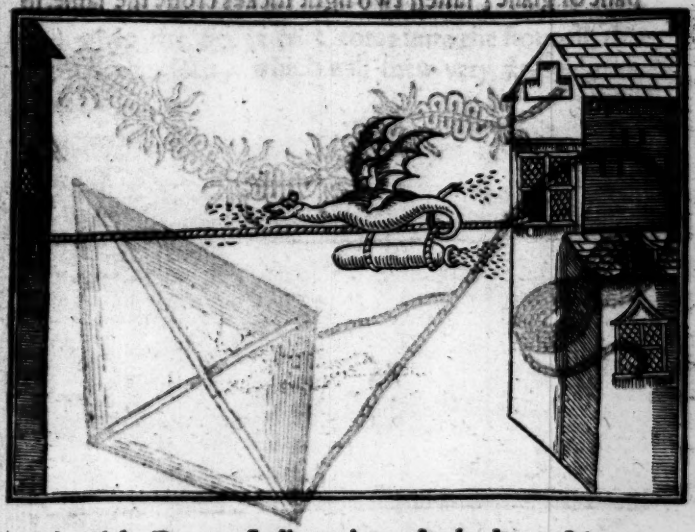
How to make Gironells, or fire wheeles.

THe making of fire wheeles conſiſteth onely in the placing of Rockets, with the mouth of one towards the tayle of another, round about certaine moveable wheels; wherefore I thinke it ſufficient only to deſcribe the diverſity of their faſhions which follow.



How to make flying Dragons.

THe flying Dragon is ſomewhat troubleſome to compoſe; it muſt be made eyther of dry and light wood, or crooked-lane plates, or of thin whalebones covered with Muſcovie glaſſe, and painted over. In the body thereof, there muſt bee a voyde cane to paſſe the rope through; unto the bottome of this cane muſt bee bound one or two large Rockets, according as the bigneſſe and

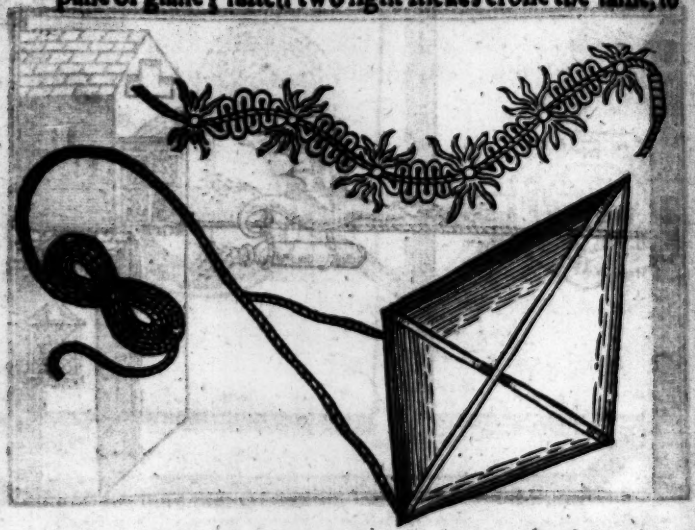


weight of the Dragon ſhall require; the body muſt bee filled with divers petrars, that may conſume it, and a ſparkling receipt muſt be ſo diſpoſed upon it, that being fired, it may burne both at the mouth and at the tayle thereof;

thereof; then hang the wings on in ſuch wiſe, that they may ſhake as the Dragon runnes along the line; you may diſpoſe divers ſmall ſerpents in the wings; marke the figure.

How to make fire Drakes.

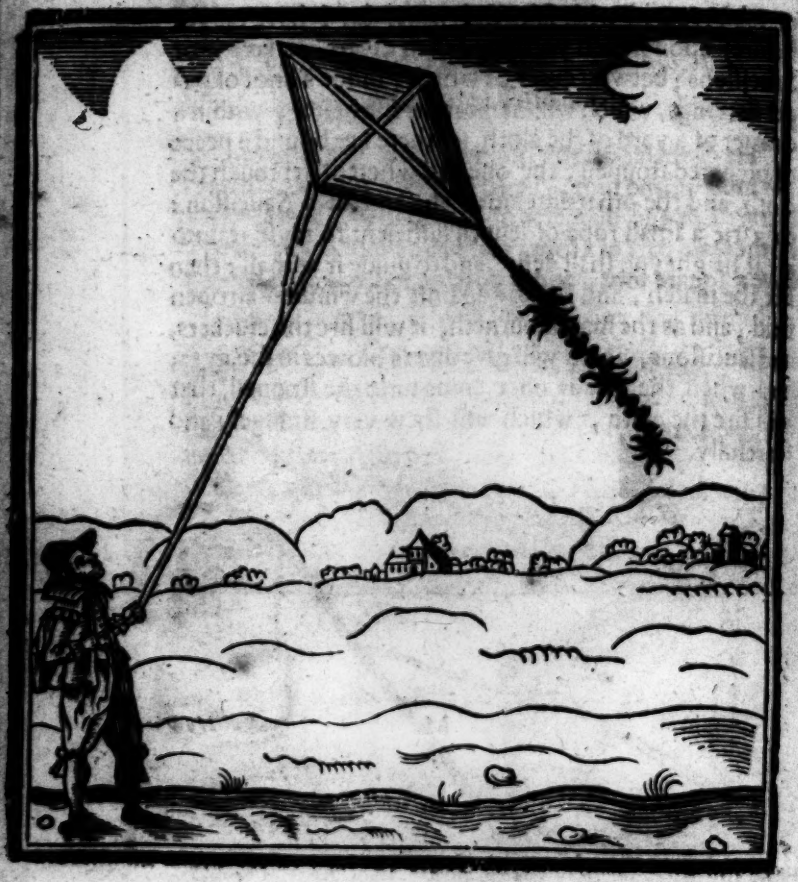
YOu muſt take a peece of linnen cloth of a yard or more in length; it muſt bee cut after the forme of a pane of glaſſe; faſten two light ſtickes croſſe the ſame, to



make it ſtand at breadth; then ſmeare it over with linſeed oyle, and liquid varniſh tempered together, or elſe wet it with oyle of peter; and unto the longeſt corner faſten a

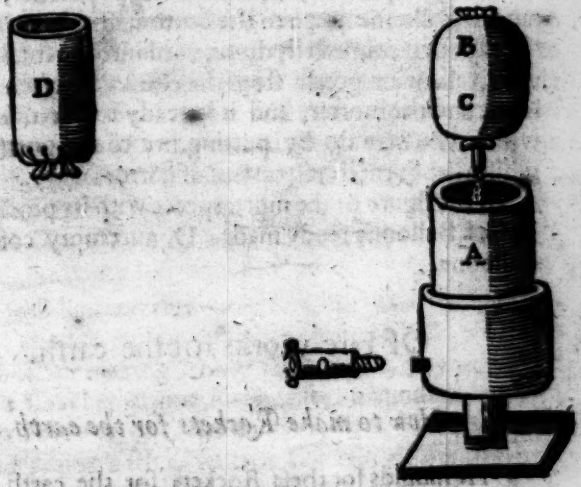
match

match prepared with ſaltpeter water (as I have taught before) upon which you may faſten divers crackers, or Sauciſſons; betwixt every of which, binde a knot of paper ſhavings, which will make it flie the better; within a quarter of a yard of the cloth, let there bee bound a peece of prepared ſtoupell, the one end whereof, let touch the cloth, and the other enter into the end of a Sauciſſon: then tie a ſmall rope of length ſufficient to rayſe it unto what height you ſhall deſire, and to guide it withall: then fire the match', and rayſe it againſt the winde in an open field; and as the match burneth, it will fire the crackers, and ſauciſſons, which will give divers blowes in the ayre; and when the fire is once come unto the ſtoupell, that will fire the cloth, which will ſhew very ſtrangely and fearefully.



How to make Balloones, alſo the morter Peece to diſcharge them.

THe diameter of the hollowneſſe of the morter Peece muſt be one foot, the longer it is the further it will carry: Let the diameter of the hollowneſſe of the ſacke be the third part of a foot, and halfe a foot deepe: it muſt have a ſquare foot, and a portfire to firew into the bot-



tome of the ſacke on the ſide of it; this portfire is to be made like a cane about three inches long, and have a bottome ſodered unto the inſide of the ſcrew, which bottome muſt be pierced with a ſmall touch-hole. This morter peece may be made of yron, red copper, or for a neede

with paſtbord, armed with cord, and glewed ouer, but the ſack, and foot of it muſt bee made of wood, and the paſtbord morter muſt bee nayled faſt upon it. A Balloone muſt be made of canuaſſe rowlede ght or nine times upon a Former, it muſt bee made ſo, that it will eaſily go into the morter peece; into this Balloone you may put Rockets, Serpents, Starres, Fiends, Petards, and one or two Sauciſſons to breake the Balloone; then choak it up with cord, and prime it with a little cane rammed full of a ſlow compoſition; fill the ſtock of the morter peece full of whole gunpowder, then ſcrew on the portfire, O, then put the Balloone down to the bottom of the morter with the cane that primeth it, downward into the ſtock; then with tallow or greaſe ſtop the chinks between the Balloone and the morter, and it is ready to bee diſcharged, which you may do by putting fire to the portfire, and while that burneth, retreat out of harmes way.

A, the figure of the morterpeece with its portfire. O, B, C, a Balloone ready made. D, an empty coffin for a Balloone.

Of Fire-works for the earth.

How to make Rockets for the earth.

THe moulds for theſe Rockets for the earth are not made like thoſe for the ayre, becauſe that it is required that theſe ſhould laſt longer, and haue a more gentle motion: obſerue therefore the following directions for the making of them, which may ſerue for all occaſions, without any alteration for bigger or leſſer. Let the diameter

meter of their hollowneſſe bee halfe an inch, let their hollowneſſe be five or ſix inches long, let the rowler for to rowle the coffins on, bee the third part of an inch thick, and let the rammer to charge it bee a thought leſſe, let the breech bee three quarters of an inch long, and let the breech enter halfe an inch into the mould, then fill it with the compoſition proper for it, obſeruing thoſe rules in the ramming it, as you did in ramming rockets for the ayre; when you haue filled it within an inch of the top of the mould, double down a quarter of the coffin, bearing it with three or foure ſtrokes of the mallet; then with a bodkin peirce it in two or three places, and then put in the quantity of a piſtoll charge of whole gunpowder, then double down the halfe of the coffin, giuing it a gentle blow or two with the mallet, and with a ſtrong packthred choak the reſt of the coffin, and what remaineth after the coffin is choaked, cut it of, and it is made.

How to make Crackers.

IT is well known, that euery boy can make theſe, therefore I think it will be but labour loſt, to beſtow time to deſcribe their making: only thus much, if you would make a Cracker to giue forty, fifty, a hundred, or two hundred blowes, one after another, then binde ſo many Crackers upon a ſtick, ſo that the end of the one may ioyne to the mouth of the other.

How to make Trunkes.

THeſe you may make of paſte-board, paper, or wood, and of what bigneſſe and length you pleaſe, and ram

them full of the compoſition of Rockets for the earth; if you would have them to change colour, then alter the compoſition that is, put in two or three ſpoonfulls of the compoſition of Rockets for the water, and ramme that in, then put in two or three ſpoonfulls of the compoſition of Rockets for the ayre, and ramme that in, then put in two or three ſpoonfulls of gunpowder duſt, and ramme that in, doe ſo till you have quite filled it, then tie a bottome of leather upon it, and pierce it and prime it with ſtoupell; after the ſame maaner may you make lanternes and lights.

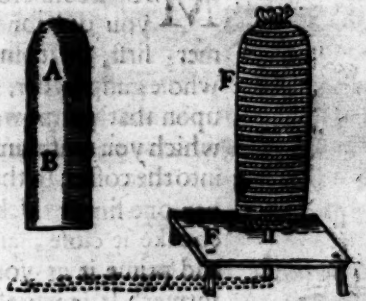
How to make tumbling balls.

MAke a ball of canvas, and faſten in it a double Rocket for the earth; you may ſtuffe the reſt of the ball with a ſlow compoſition of two parts charcoale duſt, and one part of gunpowder duſt, mingled together, and put divers petrards amongſt it.

How to make Sauciſſons.

SAuciſſons are of two ſorts, eyther to be placed upon a frame, or ſuch like, and ſo to bee diſcharged with a trayne of gunpowder, or elſe to bee diſcharged out of the morter-peece. The ſtanding Sauciſſon is thus made; you muſt roll paper or canvas, nine or ten times upon a roller as A, B, and choake the one end of it: fill it then with whole

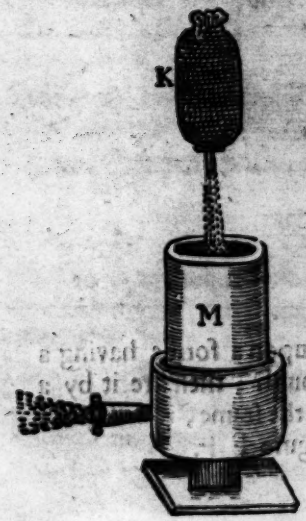
whole gunpowder, and then choake the other end alſo, then cover all the Sauciſſon with cord, and glew it over; then pierce one end of it, and prime it with a quill filled



with gunpowder duſt; place it upon a forme having a hole for the quill to paſſe thorough; then fire it by a traine of gunpowder layd under the frame, it will give a report like a canon: marke the figure F F.

How

How to make the flying Sauciſſon to be delivered out of the morter peece.



MAke a coffin for this, as you did for the former; firſt, fill it almoſt with whole gunpowder, then put upon that gunpowder duſt, which you muſt ramme hard into the coffin, ſo that it may bee one finger thicke; then choake it cloſe, and arme, and prime it as you did the former. It is repreſented by the figure, K M.

How to make a fire ſword.

YOu muſt make a ſword of woode, having a deepe channell in the backe of it, wherein place firſt a Rocket for the ground; then two or three ſerpents upright; (with their mouthes inward) let the ſtoupell that primeth the

the Rocket come under the mouth of the ſerpents, ſo that being kindled, it may ſet them on fire, and enter the breech of the next rocket, ſo fill the channell quite full

with rockets and ſerpents, binde the rockets faſt into the channell, but the ſerpents muſt be placed ſo, that being once fired, they may fly out of the channell, and it is made: mark the figure G, P.

The deſcription and making of three ſorts of Fire-lances.

TO make the firſt Fire-lance, whoſe figure is noted A, you muſt make a hollow trunk of what length or bigneſſe you pleaſe, either of wood, paper, or paſtbord rowled on a rowler, and armed with ſome cord and glew: firſt put into the bottom of whole gunpowder about one or two fingers thick; then ram upon it a paſtebord peirced with a little hole in the middle, hauing a quill faſtned in it, which quill muſt be filled with a ſlow compoſition, or elſe with gunpowder duſt: this quill muſt ſtand up in the lance two or three inches; then fill the coffin up to the top of the ſaid quill with ſtarres, and ſtrew among the ſtarres ſome gunpowder duſt, then put paſtebord ouer them, having a hole for the quill faſtned in the former bottom of paſtebord to paſſe; then upon this paſtebord

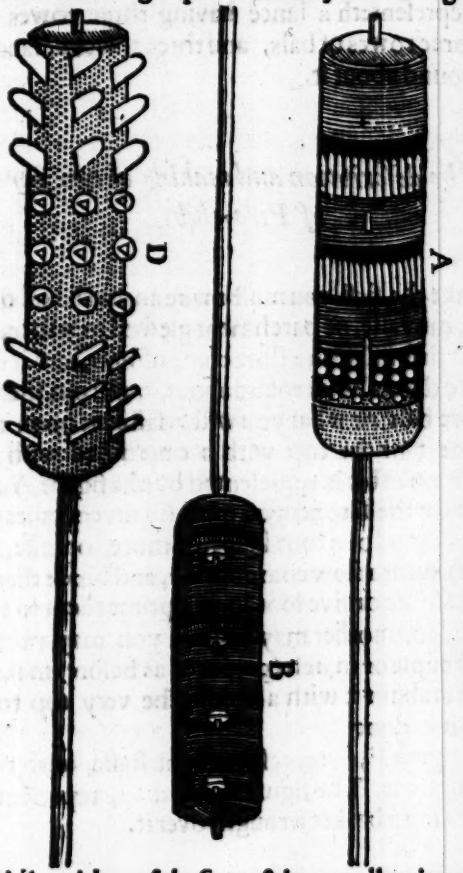
ram gunpowder duſt one or two fingers thick, then put a row of ſerpents in, and in the midſt of the ſerpents put a cane open at both ends, and filled with gunpowder duſt; this cane muſt be ſomewhat longer than the ſerpents, and it muſt paſſe through a paſtebord, which muſt bee put ouer: then put ſome more gunpowder duſt, and ram it in upon it, and upon that put another row of ſerpents, with a cane in the midſt of them filled with a ſlow compoſition, and upon them put gunpowder duſt, or elſe a ſlow compoſition, ramming it in till the lance bee full; then put a paſtebord upon it, and in the midſt of the paſtebord put a little cane filled with a ſlow compoſition, then faſten it upon a ſtaffe of what length you will, and it is made.

To make the ſecond Fire-lance, you muſt prepare a trunk like unto the former, firſt ram in the bottom of it ſome of the compoſition of rockets for the earth about two fingers thick, then put a paſtebord upon it, having a petard faſtned in the middeſt; this paſtebord muſt bee pierced in three or foure places, round about the petard, that thereby the powder that is rammed ouer the paſtebord may take fire: then ram in ſome more compoſition upon the petard, about two or three fingers thick, then another petard, then more compoſition, ſo doing untill you have filled the trunk: then faſten it upon a ſtaffe, and and prime it as you did the former, it is repreſented by the figure noted B.

To make the third Fire-lance you muſt haue a trunk alſo, which muſt bee rammed full of a ſlow compoſition, of two parts charcoale duſt, and one part gunpowder duſt well mixed, prime it as the former, then bore divers holes round about it, from the top to the bottom, into e-

very

very of which holes glew a ſauciſſon, or a ſerpent, or a little ball filled with gunpowder duſt, and having a petard



in the middle: either of theſe muſt bee well primed, and their primed ends muſt be towards the inſide of the lance,

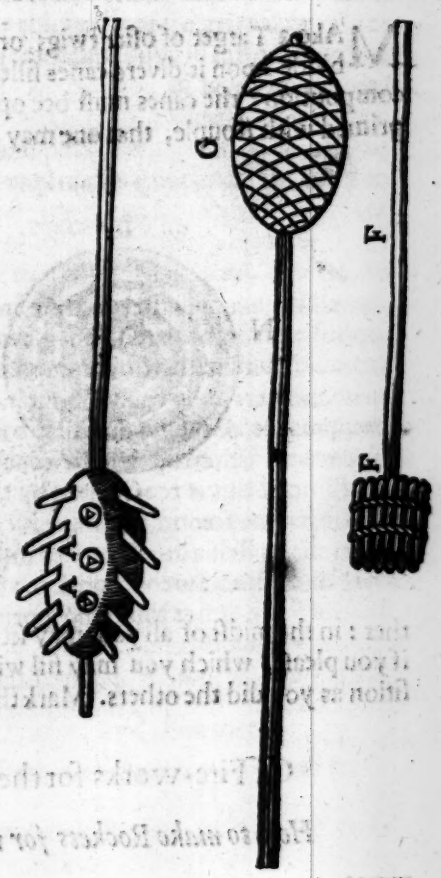
ſo that as the lance burneth downward, it may orderly give fire unto the ſauciſſons, bals, and ſerpents: the figure D repreſenteth a lance having three rowes of ſerpents, three rowes of bals, and three rowes of ſauciſſons, faſtned round about it.

The deſcription and making of two ſorts of Fire-clubs.

TO make the firſt you muſt make an ovall ball of paſtebord, canvaſſe, or parchment glewed together, which you muſt firſt fill with a ſlow compoſition, ram it in, and then bore divers holes round about it, and put therein ſerpents, fire bals, or what you will: faſten it upon a ſtaffe, and prime it in the top with a cane filled with a ſlow compoſition: this is repreſented by the figure A, A.

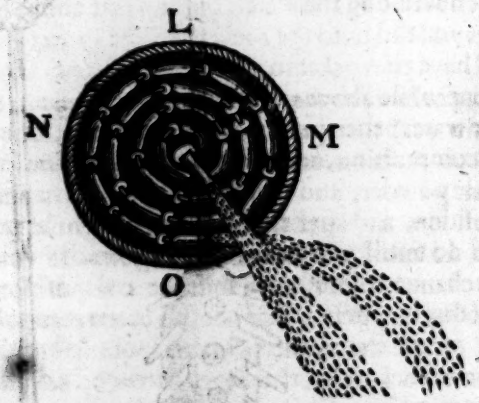
To make the ſecond you muſt fill divers canes open at both ends (and of a foot long, or more, or leſſe, as you think fit) with a ſlow compoſition, and binde them upon a ſtaffe of foure or five foot long; prime them ſo that one being ended, another may begin: you may prime them with a ſtouple or match (prepared as before) make an oſier basket about it with a hole in the very top to fire it by, and it is done.

The figure F, F, repreſenteth the ſtaffe, with the canes bound upon it. The figure marked G, repreſenteth the ſtaffe having a basket wrought over it.


G
F
E

How to make a Fire-target.

MAke a Target of ofier twigs, or elſe of light wood, & binde upon it divers canes filled with a very ſlow compoſition: the canes muſt bee open at both ends, and primed with ſtouple, that one may give fire unto ano-



ther: in the midſt of all you may ſet up a large cane alſo, if you pleaſe, which you may fill with the ſame compoſition as you did the others. Mark the figure L, M, N, O:

Of Fire-works for the water.

How to make Rockets for the water.

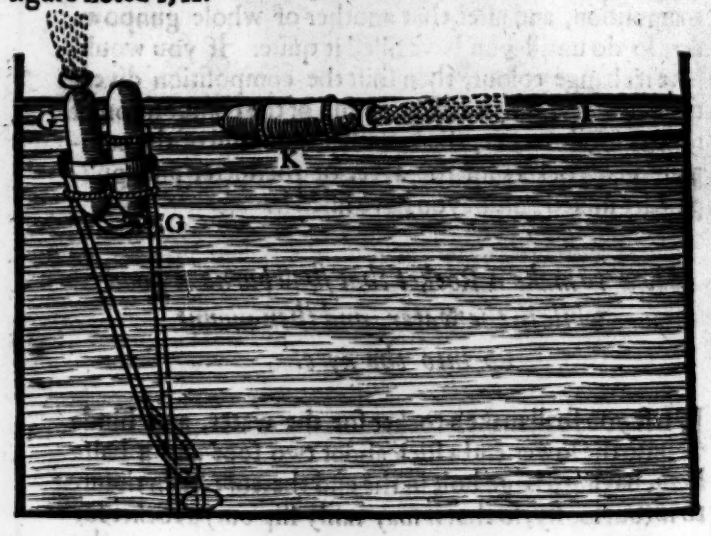
THe diameter of hollowneſſe of the mould for Rockets that ſwim on the water, muſt be one inch, and eight inches

inches long : let the breech enter into the body of the Rocket one inch, and it must have no broach at all in it. Let the diameter of the thicknesse of the rowler bee three quarters of an inch, the rammer must be a thought lesser; then ram it full of the composition of Rockets for the water; joyne to the upper end of it a Sauciſſon: then couer it all over with melted pitch, roſin, wax, or tallow, to the end that the water may not ſpoyle the coffins; and to make it float along the water, binde a rod about two foot long, as you did unto the rockets for the ayre: now if you would have the rocket to change his actions, (that is, to ſwim one while above the the water, and one while under the water) then put into it in the filling, one ſpoonfull of compoſition, and ram that in; then one ſpoonfull of whole powder, and ram that in; and then another of compoſition, and after that another of whole gunpowder, ſo do untill you have filled it quite. If you would have it change colour, then ſhift the compoſition divers times, (that is, put in one ſpoonfull of the compoſition of rockets for the water, then another ſpoonfull of the compoſition of rockets for the ayre, or rochpeter and gunpowder mixed) untill you have filled it.

How to make a Rocket that ſhall burne a good while in the water, and then mount up into the ayre.

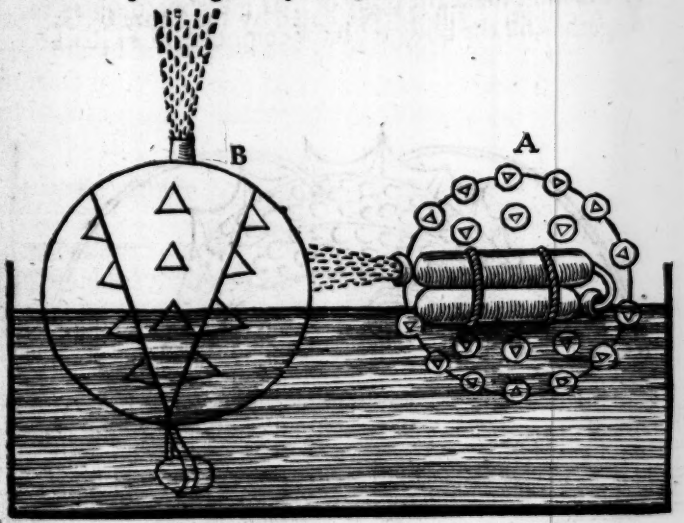
FIrſt you ſhall make a rocket for the water, and binde unto the lower end a ſtick about two ſoot and a halfe long, having a large hole in the end thereof: then tie unto it (but loofly, ſo that it may eaſily ſlip out) a rocket for the

the ayre, and let the ſtouple that primeth for the rocket for the ayre, enter into the breech of the water rocket, then let the end of the rod of the rocket for the ayre enter into the hole of the rod of the rocket for the water: beſmeare then both the rockets with tallow, greaſe, or wax, or any oyle colour that the water may not ſpoyle the coffins of the rockets; then bang a ſtone at the bottom of the ſtick that hath the hole in it, to make it ſink down into the water; then fire the water rocket, and caſt them into the water; the fired rocket will burne in the water, and being conſumed, will giue fire unto the other rocket, which being looſly tyed, will ſlip the bond, and mount up into the ayre. This is repreſented by the figure G, G. The floating rocket mentioned before, is expreſſed by the figure noted I, K.



The deſcription and making of two ſorts of fire-bals for the water.

FOr to make the firſt, you muſt make a ball of Canvas, about the bigneſſe of a Foot-ball, or bigger if you pleaſe, and faſten in it a double Rocket for the water: if you will, alſo you may ſtuffe the reſt of the ball with the compoſition that will burne under the water, and cut holes in the ſides, and therein faſten other bals, and petrards in them: then cover the ball over with Tallow, Pitch, or painting, except the place where the Rocket is

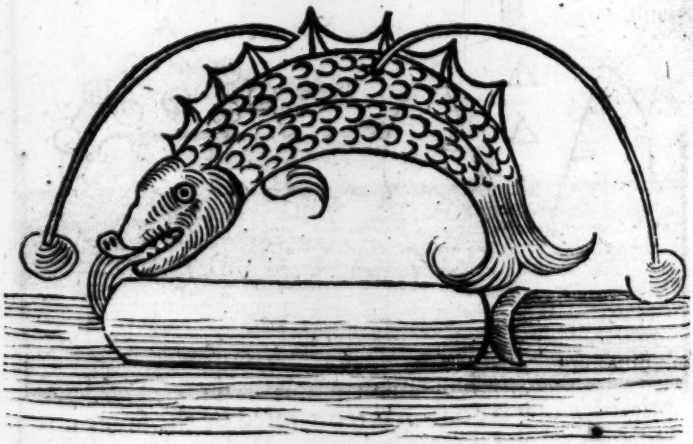


primed, and it is done. It is repreſented by the figure noted with A, and it will tumble up and downe in the water.

To make the ſecond fire-ball, you muſt firſt make a ball of Canvas, Paſteboard, or ſuch like, and cut a wide hole in the top of it, and place in it a channell of Tinne pierced in divers places: fill the channell with the compoſitions of Rockets for the water; againſt every hole thereof, place a petrard: cover it with a cover, pitch it over, and prime it, then ballaſt it with leade, or a ſtone, that the vent may burne upwards, and it is done. It is repreſented by the figure B.

How to make a Dolphin.

YOu muſt make the body of it of Paſteboard glued together, fill the body with the compoſition of Rockets



for the water, pierce it in the back with divers little holes, wherein

wherein put Serpents, beſmeare the body all ouer with the following pap: Take gunpowder duſt, foure ounces, camphire, and ſulphur, or brimſtone in powder, of each one ounce, make them into a ſoft pap with oyle of tiles, then binde unto it a large Rocket for the water, which Rocket muſt be armed (as afore) that the water may not hurt it: then ballaſt it with a wyre, hauing at each end a piece of lead of weight ſufficient, and it is done. Marke the figure.

I might haue beene infinite in the deſcribing of ſuch like with Ships, Towres, Caſtles, Piramides. But conſidering that it would but increaſe the price of the booke, and not better your underſtanding: ſince all conſiſt of the former workes, which are ſo plainely deſcribed, as that the moſt ignorant may eaſily conceiue thereof, and (if any whit ingenious) thence contriue others, of what faſhion they liſt.

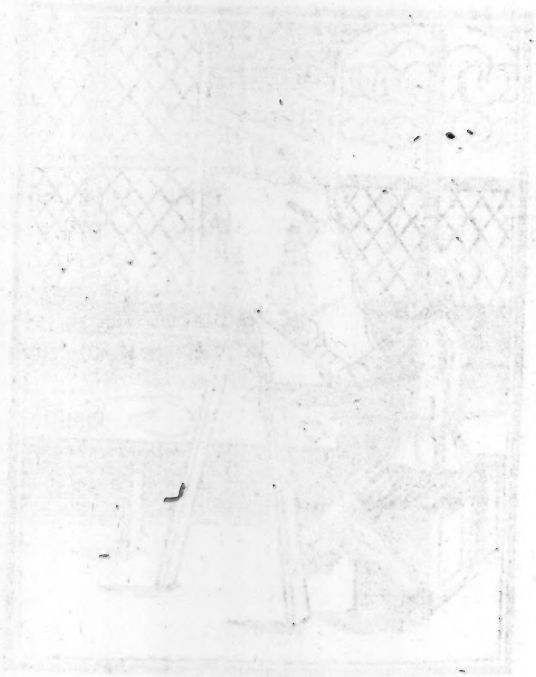
FINIS.

THE THIRD BOOKE

Of Drawing, Limming, Colouring, Painting, and Graving.

By *I. B.*

LONDON.
Printed by THOMAS HARPER, for RALPH MAB,
1634.



THE THIRD BOOKE of Drawing, Painting, Limming, Graving.

THE Art of *Drawing* is in it ſelfe moſt excellent, and moſt worthy commendations in whoſoever it is: yea it is an Art ſo neceſſarie unto all ingenious Artiſts, as that in no wiſe they can be without it, and my ſelfe haue found it to bee true, that the ſight of a good draught is more unto an ingenious perſon, then a whole Chapter of Information; Wherefore I have, according unto my knowledge and practiſe therein, faithfully penned the ſame; for the uſe of all ſuch as beare affection unto the Art, and are deſirous to be inſtructed therein: And for that divers perſons cannot attaine unto it, or perhaps are loath to beſtow any time to practiſe it: whereby they might come to a requiſite perfection: for ſuch I have ſet downe certaine directions, and thoſe ſo facile, and eaſie; that perſons altogether unskilfull, may (having a patterne) worke very well; But before

before I begin, it behooveth that I preſcribe what things are to be had in readineſſe to worke withall: firſt therefore provide good ſmooth and cleare paper, divers plummets made of blacke leade, oker, or blacke chalke, or elſe Charcoals made of Aſh, Sallow, or Beech, ſplit in ſunder, and pointed; alſo a wing: having provided theſe your implements, you ſhall thus begin to worke. Firſt, let the thing, whoſe pourtrature you intend to take, ſtand before you, ſo that the light be not hindred from falling upon it, and with a pointed peece of charcoale draw it ruſtically; which when you have done, conſider a while whether all the parts thereof are proportionable, and whether it carry the ſemblance of the thing that you drew it from, which if it do not, wipe it out with your wing, and begin anew: but if it be faulty in one part onely, wipe onely that part out, and draw it againe; whenſoever it liketh you, or that you have ſo drawne it, that you can finde no great fault in it: wipe it over gently with your wing, ſo that you may perceive the former ſtrokes: then with your blacke chalke, or blacke lead plummets, draw it as perfectly, and as curiouſly as you can, and ſhadow it according as the light falleth upon it; This way is workeman like, and the moſt difficult of all, yet by a little practice may eaſily be attained unto: ſo that the perſons ſtand well affected unto the Art. Inſtead of white paper, you may take light coloured blew paper, and draw upon it with charcoale, and white chalke pointed, which will ſhew very wel: but note, that after you have made your draught, you muſt wet it in faire water, and let it dry of it ſelfe; this will make the drawing to hold faſt on, which would otherwiſe eaſily be wiped off. This may ſerve for ſuch as are contented to take ſome paines to attaine ſo noble a

Science.

Science. But for others there are divers other helps, which follow in order.

How to take the perfect draught of any printed, or painted Picture.

TAke a ſheete of Venice (or in ſtead thereof) of the fineſt white paper that you can get: wet it all ouer with cleane ſallet oyle: then wipe the oyle off from the paper, as cleane as you can, ſo that the paper may be dry, otherwiſe it will ſpoyle a printed picture by the ſoaking through of the oyle: hauing thus prepared your paper, lay it upon any painted or printed picture, and you ſhall ſee the picture through the ſame more perfectly appearing, then through glaſſe, and ſo with a blacke lead pen, you may draw it ouer with eaſe, and better firſt with a ſoft char-cole, and then with a pen. After that you haue thus drawne the picture upon the oyled paper, put it upon a ſheete of cleane white paper, and with a little ſticke pointed, or (which is better) with a feather taken out of a Swallowes wing: draw ouer the picture againe, and ſo you ſhall haue the ſame very prettily and neatly drawne upon the white paper, which you may ſet out with colours, as ſhall be taught hereafter.

Another way.

HAuing drawne the picture, firſt open the oyled paper, put it upon a ſheete of cleane white paper, and pricke ouer the ſame drawing, with a good big pin, then from the cleane ſheete, that is pricked, pounce it upon

another: that is, take ſome ſmall coale, powder it fine, and wrap it in a piece of Tiffanie or ſuch like, and binde it up therein looſely, and clap it lightly ouer all the pricked lines by little and little, and afterwards draw it ouer again with a Pen or Pencill, or otherwiſe as you pleaſe.

Another way very pretty and eaſie to be performed.

TAke ſome Lake, and grinde it fine, and temper it with Linſeed oyle, and afterwards with a pen, draw with this mixture (in ſtead of Inke) all the out ſtroaks of any printed picture, alſo the muſcles: then wet the contrary ſide of the picture, and preſſe it hard upon a ſheete of cleane white paper, and it will leaue behinde it all the ſtroakes of the ſaid picture that you draw ouer.

Another way much like the former.

TAke Printers Blacking, grinde it fine, and temper it with faire water, and with a pen dipt therein, draw ouer the maſter ſtroakes and out lines of the muſcles: wet then a faire paper with a ſponge, and clap the picture upon it, preſſing it very hard thereupon, and you ſhall finde the ſtroakes you drew, left upon the faire paper.

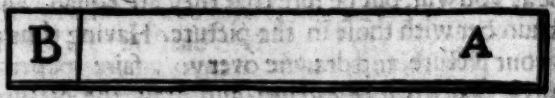
An eaſie way to leſſen any picture: that is, to draw a picture from another, in a leſſer compaſſe.

FIrſt, with a ruler, and a blacke lead plummet, draw a line at the very top: alſo another at the bottome parallell,

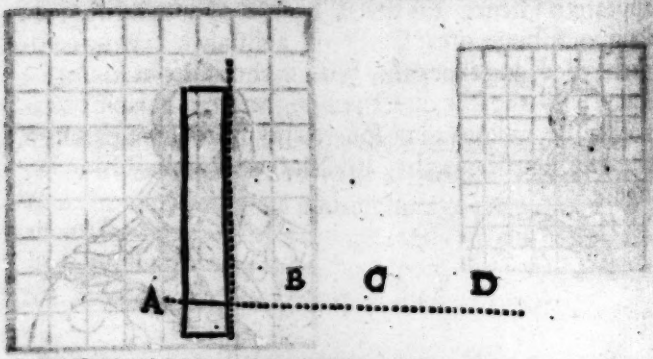
lell, or equally diſtant from the other: from the upper line, let fall two perpendicular or plum lines euen unto the lowermoſt line, ſo thoſe foure lines will make a ſquare: now you muſt diuide this ſquare into diuers equall parts, with a paire of compaſſes, and draw lines with a ruler and blacke lead plummet, quite over the picture: ſo the leſſe lines will diuide the picture into equall parts or ſquares: then take a faire paper, and make as many ſquares upon it, as there is in the picture: you may make them as little as you will, but be ſure that they are equall, and of juſt number with thoſe in the picture. Having thus croſſed your picture, and drawne over your faire paper into ſquares, take a blacke lead pen, and draw the picture by little and little, paſſing from ſquare unto ſquare, untill you

have finiſhed the whole: ſtill obſerving the order of the ſquares as they ſtand in either: then draw it ouer with a pen, in which ſecond drawing of it over, you may eaſily mend any fault: when it is dry, rub it over with the crum

of white bread, and it will take off all the blacke lead ſtrokes, and your draught onely will remaine faire upon the paper or parchment. Here I might have entred into diſcourſe of drawing paralels, perpendiculars, making of ſquares, and ſuch like: but to deale truely, I was as loth to trouble my ſelfe, as to wearie you: you ſhall neede onely to provide a ruler of thin braſſe or copper, having a croſſe thwart one end of it: the charge will not be much, nor the uſe tedious: the figure followeth, noted A, B.



Let *a*, *b*, *c*, *d*, be a line given, whereon to erect a perpendicular or plumb line: lay the ruler ſo, that the croſſe

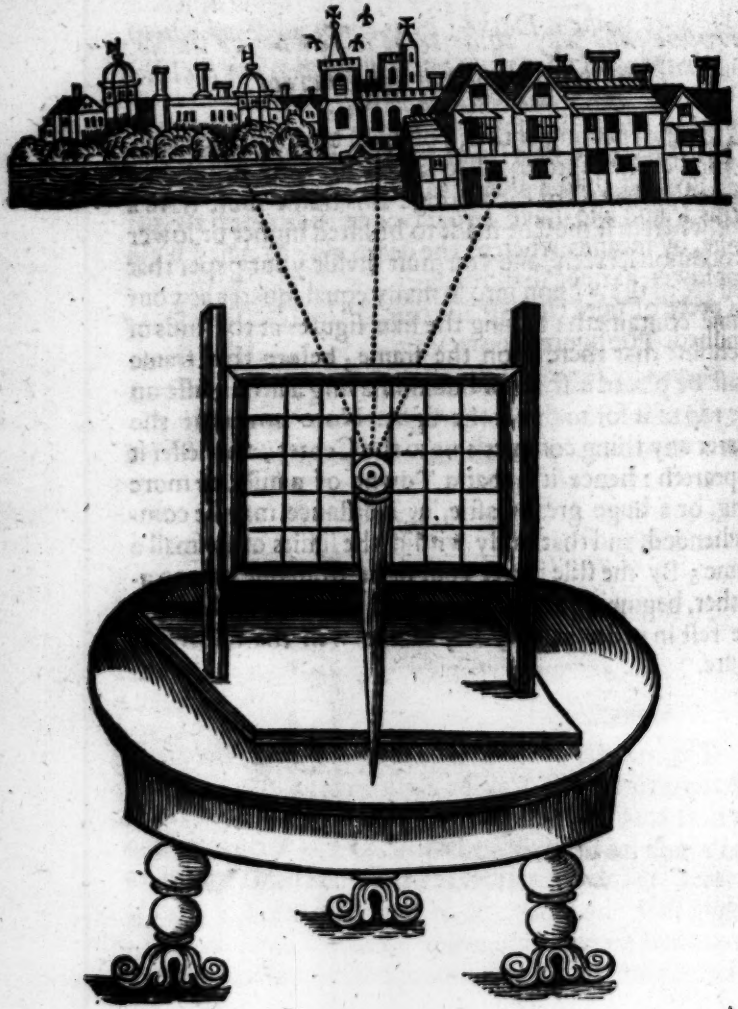


over the end of it, may lye full upon the Line, then draw a Line by the ſide of the rule, and it is done.

A

A verie easie way, to describe a Towne, or Castle: being within the full sight thereof.

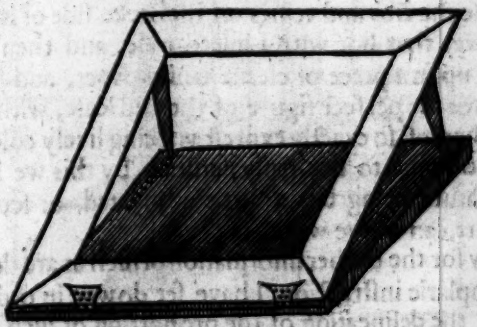
FOr the effecting of this, you must have a frame made, and crossed into equall squares with Lute strings, and figured at the end of each string: this frame must have a foot, wherein it must be made to be lifted higher or lower as occasion serveth; also you must divide your paper that you are to draw upon into so many equal squares as your frame containeth: having the like figures at the ends of each line that there is on the frame; before this frame must be placed a style or bodkin having a little glasse on the top of it for to direct the sight. Note now that the nearer any thing commeth unto the Center, the lesser it appeareth: hence it is that a Towne of a mile, or more long, or a huge great Castle, at a distance may be comprehended, and that easily within the limits of so small a frame; By the stile direct your sight from one part to another, beginning at one square, and proceeding through the rest in order as they lie, Marke well the following figure.



How to make a Deske: by meanes whereof you may draw, and that moſt exactly with great facilitie any printed picture, or ſollid Image.

FIrſt let there be a frame made, and with hinges let be joynted unto a board of equall breadth unto it: let this frame alſo have two ſtayes at the top, at each end one, by meanes whereof the deske may be raiſed higher, or lower, as need ſhall require; then faſten to the frame a peece of pure cleare glaſſe fitted thereunto, and it is finiſhed. The figure followeth.

The Deske.



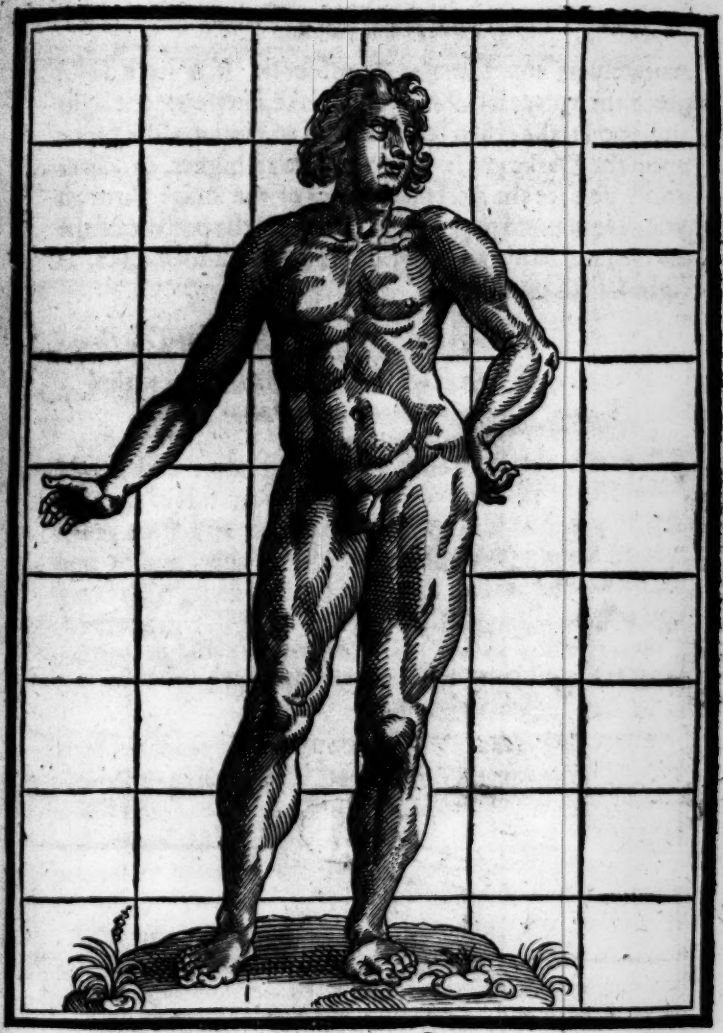
The manner of uſing this Deske is thus, If the picture that you intend to draw be a printed one, then firſt faſten it next unto the Deske with waxe, paſte, or ſuch like: upon it faſten a ſheet of faire paper: If it be in the day-time place the backe of it towards the Sunne; if it be in the night that you worke, place a lampe behinde it, and ſo you ſhall ſee perfectly every (even the leaſt) ſtroake of the picture, which with your penne you may draw as acurately

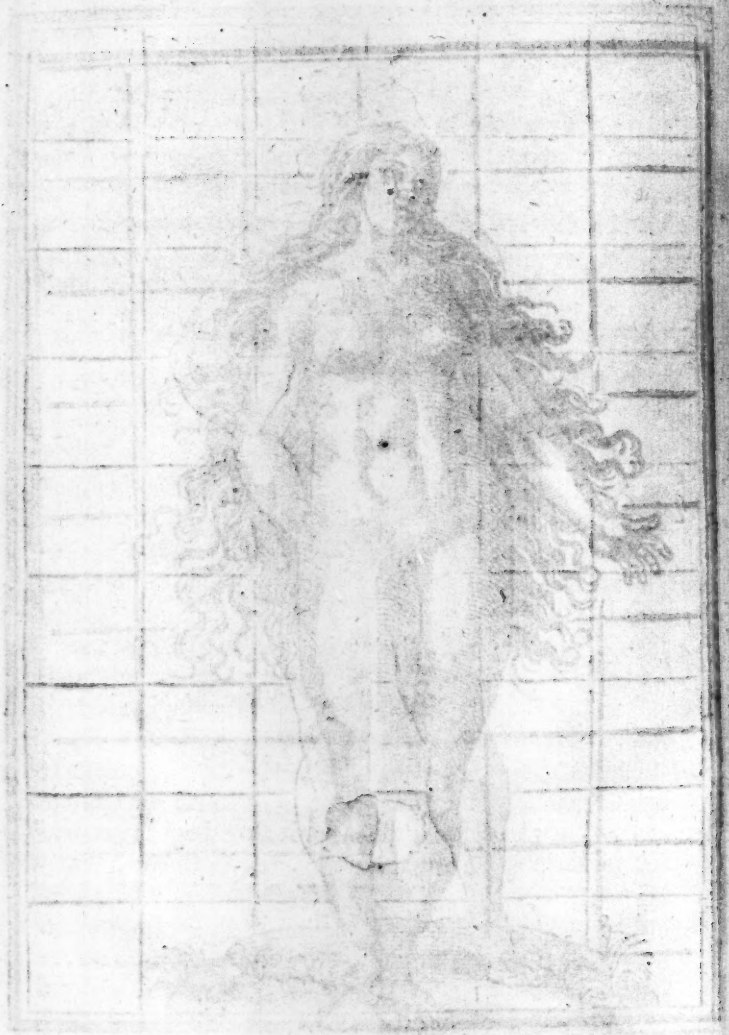
acurately as any Limmer whatsoever. If it be a solid peece, then place it behinde the Deske, betweene the light and the Deske: then fasten a sheet of cleane white paper upon the Deske; raise then the Deske higher, or lower untill you see the perfect shadow of the image through your Deske, and paper, and then draw the posture of the Image, and shadow it afterwards (without the Deske) as light falleth upon it.

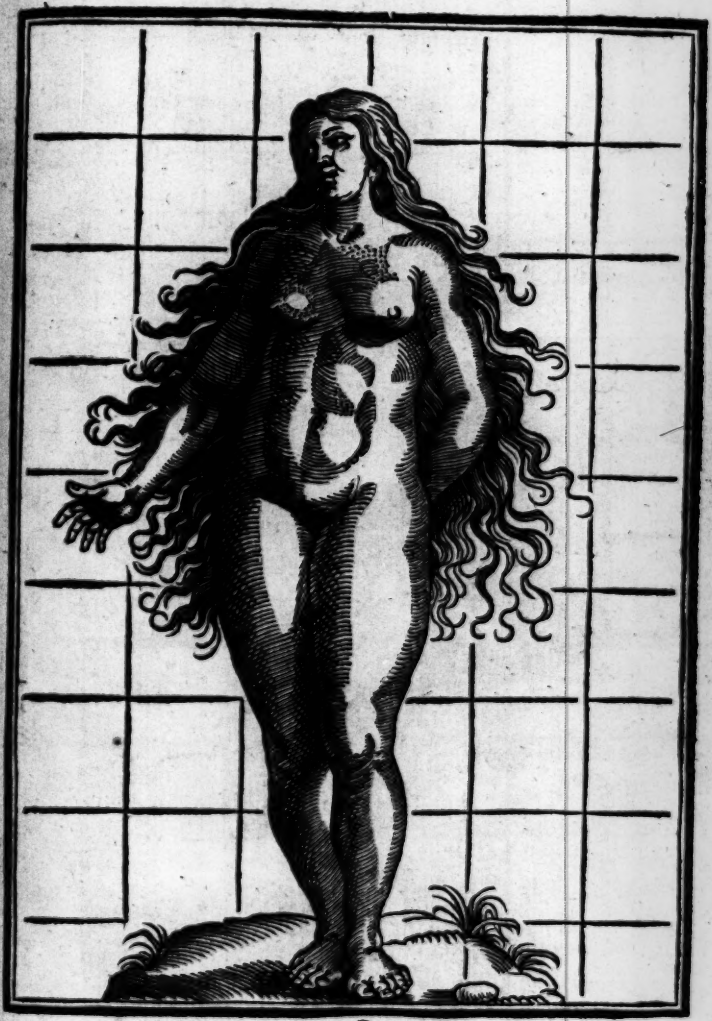
An easie way to take the naturall, and lively shape of the leafe of any hearbe or tree, which thing passeth the Art of man to imitate with Pen or Pensill.

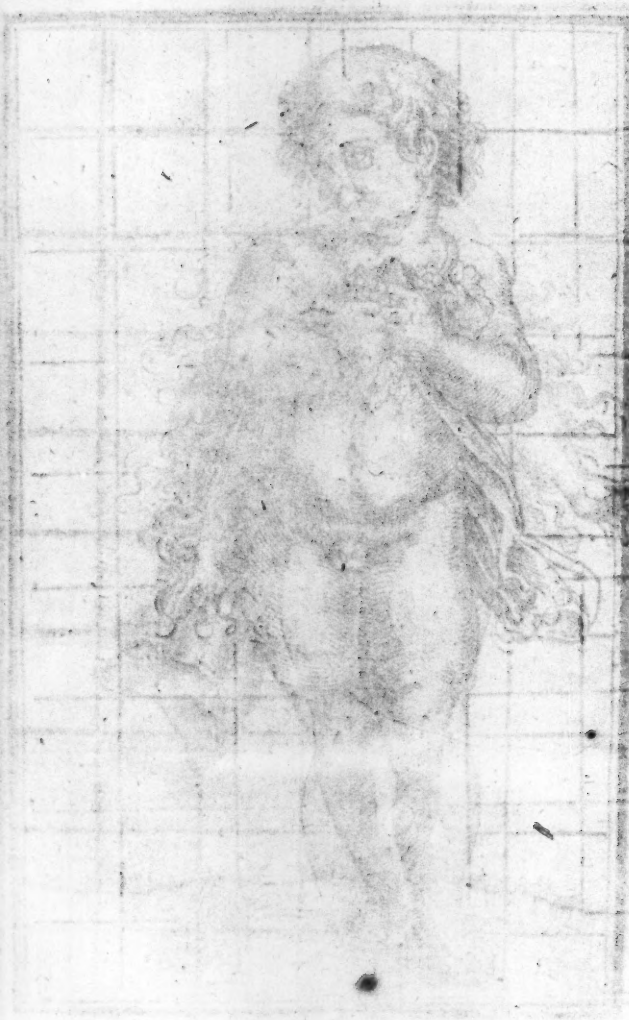
FIrst take the leafe that you would have, and gently bruise the ribs and veines on the backe-side of it, afterwards wet that side with Linseed-oyle, and then presse it hard upon a peece of cleane white paper, and so you shall have the perfect figure of the said leafe, with every veine thereof, so exactly expresst as being lively coloured, it would seeme to bee truly naturall, by this we learne, that Nature being but a little adjuvated or seconded with Art, can worke wonders.'

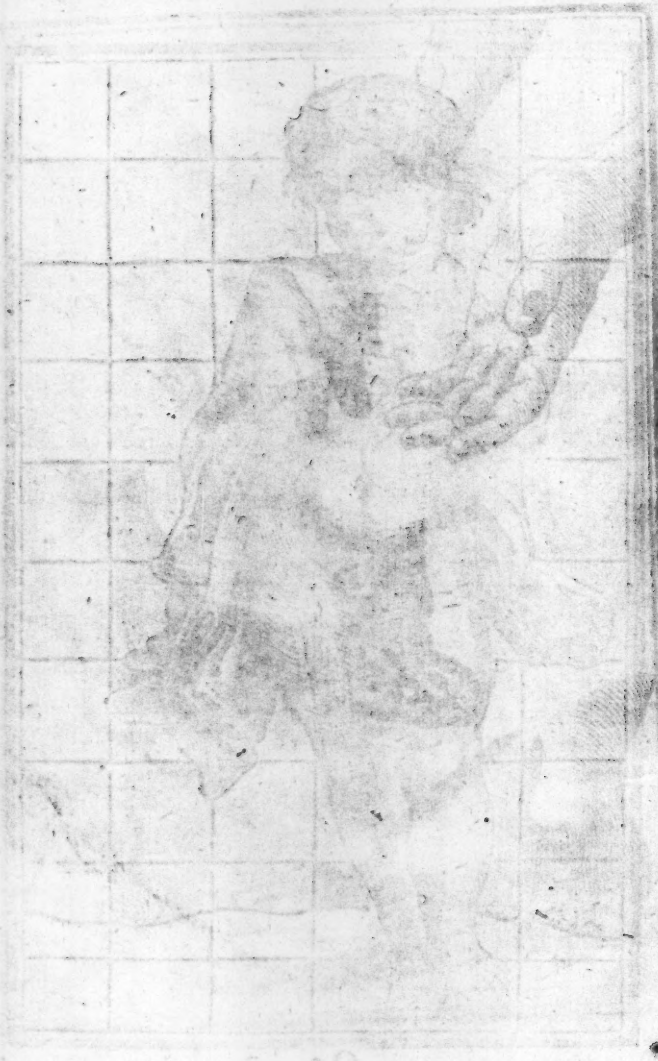
Now for the farther information of such as are desirous of exemplarie instruction, I have set downe in order following the delineation of the proportion of such things as in my iudgement seemed most necessarie for young beginners, and those in such easie demonstrations as for the most part they consist of equall squares, and require no more for their right understanding, then diligent observation, I might have filled a whole Booke of such like: but having considered that what I had done, was a sufficient ground for a farther procession, I thought fitting to leave each person to the exercise and practise of his best Invention.

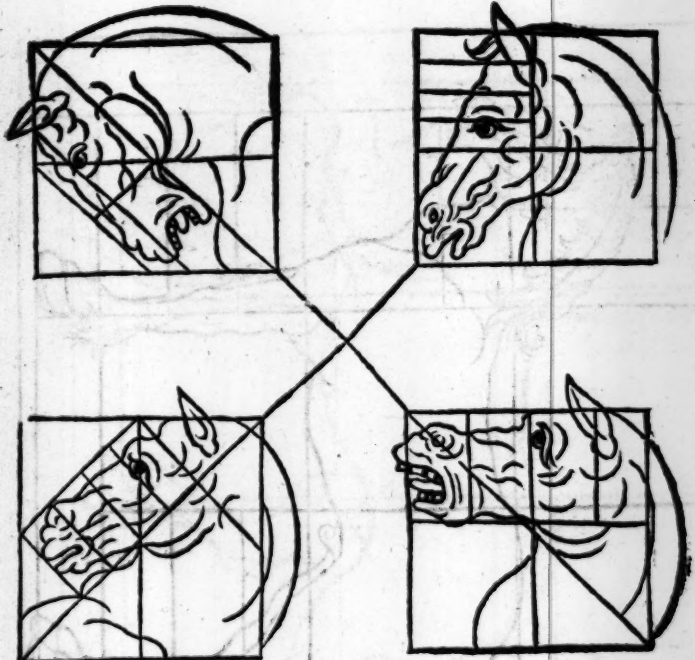


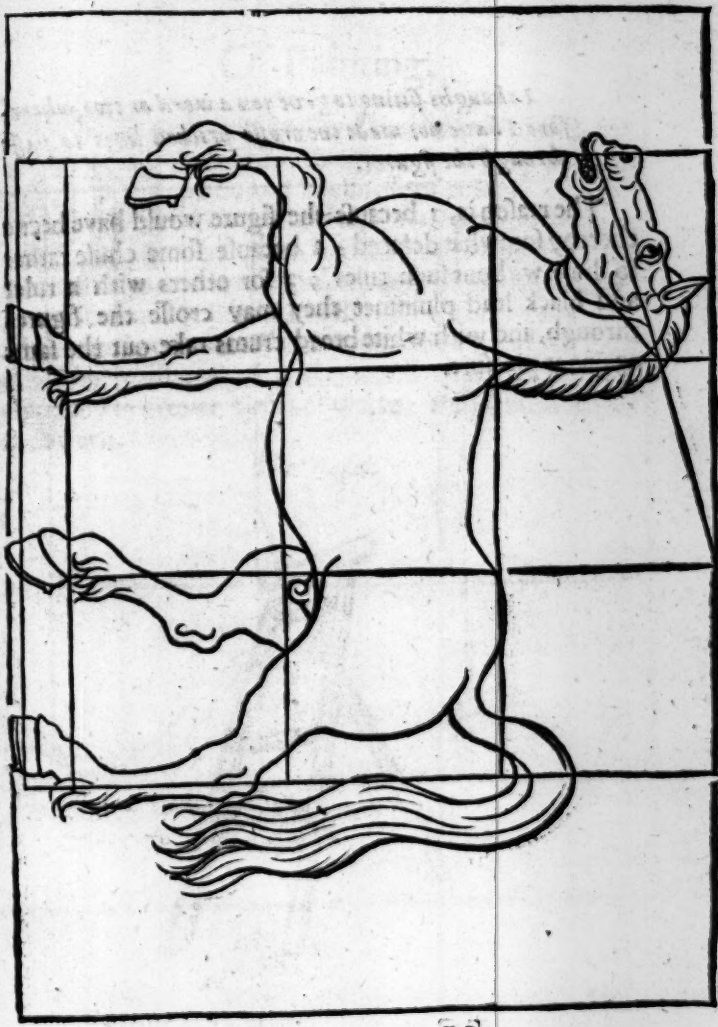






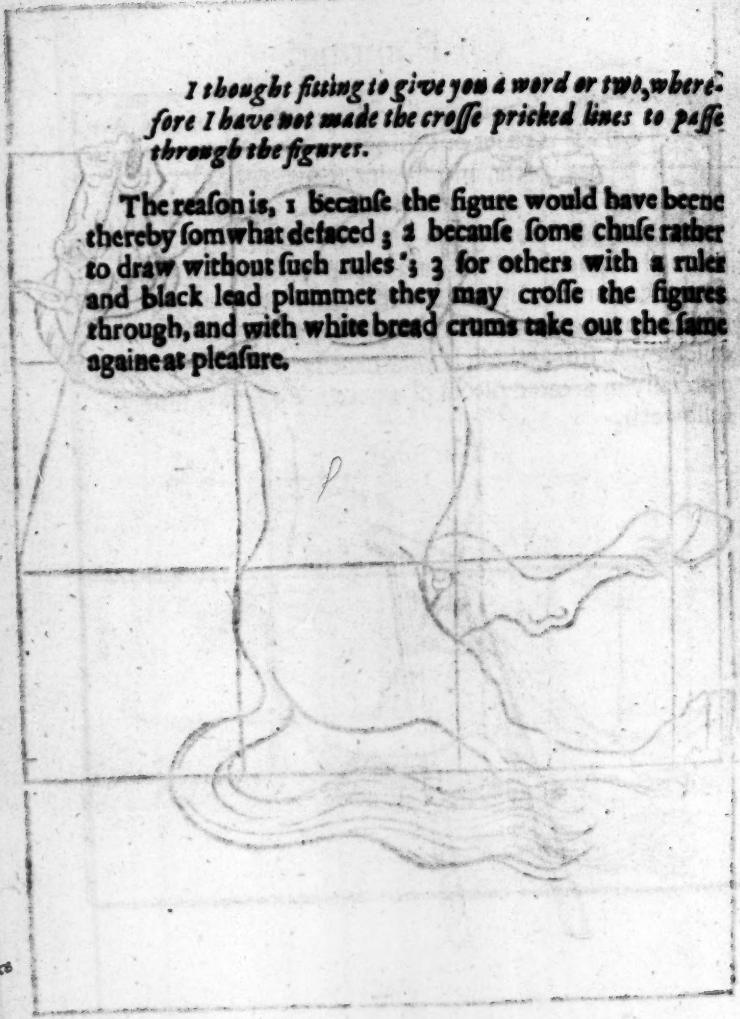






I thought fitting to give you a word or two, where-fore I have not made the croſſe pricked lines to paſſe through the figures.

The reaſon is, 1 becauſe the figure would have beene thereby ſomwhat defaced; 2 becauſe ſome chuſe rather to draw without ſuch rules; 3 for others with a ruler and black lead plummet they may croſſe the figures through, and with white bread crums take out the ſame againe at pleaſure.



Of Painting.

THe principall end and ſubject of this Art, is to ſet out things both in proportion of parts, and livelineſſe of colour.

For the former, the proportion of parts, I have given ſufficient information for the meaneſt capacitie in the precedent part of this tractat: now therefore I will ſpeake of the other, the colouring or ſetting out in colours. But firſt provide a frame or Eaſel called by Artiſts, which is very neceſſary to worke upon, eſpecially in greater pieces of worke: the forme whereof followeth.

The Eaſel.

Alſo,

Alſo you muſt provide divers little ſhels to put your colours in, alſo penſils of all ſorts, both for priming and other: a light ruler of one foot and a halfe, or two foot long: and colours of all ſorts ground very fine upon a porphire or marble. Having provided theſe, you ſhall ſet to worke, obſerving the ſubſequent directions.

Painting may be performed either with water colours, or with oyle colours.

Firſt I will ſpeake of water colours, wherein I ſhall obſerve two things.

Firſt, the diverſitie of colours, and preparations. Secondly, their mixture, and manner of laying them on the ground.

Firſt of the firſt, the diverſitie of colours and their preparation.

Colours are either ſimple or compounded, meerely tinctures of vegetables, or ſubſtances of minerals, or both: the ſimple colours are ſuch as of themſelves, being tempered with the water or oyle, doe give a colour. The compounded are ſuch, whoſe ingredients do exceed the number of one. Vegetables are rootes, juces, berries, and ſuch like things as grow out of the earth. Minerals are ſuch as are dig'd out of the earth, as earth, and ſtones, &c. All which follow in order, as well their preparations, as deſcription. Firſt note that every colour to be ground, ought firſt to be ground with the gall of a neat: then let them dry of themſelves in a cold place, afterwards grinde them with gumme water for your uſe.

Now I am come to the ſecond thing obſervable (to wit) the mixture and laying the colours on the grounds, which is thus: your colours prepared for uſe, ought to be tempered according unto direction, ſtill obſerving a meane:

meane: and to that end, mixe them by little and little, till the colour please you; first you must lay on the ground colour, and let it dry throughly: then with a small pensill, pricke on the second colour, else it will be apt to run abroad, nor can you worke it so well, to make it seeme liuely, as you may by pricking it on, especially in small peeces.

If you are to paint ouer maps, or printed pictures that haue writing in them, they use to lay on the thinnest colours, and alwaies before you lay any colours upon paper, wet the backe side of it with faire water, wherein store of Allum hath beene dissolued, and let it dry of it selfe: after wet it againe, and let it dry: doe it the third time, for this will strengthen the paper, that the colour shall not sinke through it, and moreouer it will make the colour shew the brighter, and last, the better.

To make Gum water to temper your Colours with.

TAke cleane water, and put into it of gum Arabicke a little, and let it stand untill the gumme be dissolued. Now you must haue a care that it be neither too thicke, by reason of the Gumme, nor yet too thin: for with the one you cannot worke well, and the other will not binde the colour fast.

A Purple colour.

TAke two pound of Heidleber, two ounces of Allum, halfe an ounce of ashes of Copper, halfe a pound of water, put them into a Skillet, and let them boyle till a

third be consumed: when it is cold, straine it into a cleane vessell, and let it stand a while, then straine it into another, and then let it stand till it be thicke enough.

A Crane Colour.

You must onely grinde blacke Lead with Gum water.

Browne Colour.

TAke good browne, and grinde it with Gumme water: his false colour is made with two parts browne, and a third part white lead, sad it with the same browne.

Hayre Colour.

Take Vmber or Spanish browne, grinde it, temper it with Gumme water.

A Blew.

Boyle Mulberries with Allum.

An Emerauld Colour.

TAke Verdigreese, and grinde it first dry, and put unto it a little of the Gall of a neat: also of Saffron, and the juyce of Rew, of each a little: grinde them together, and put them into a shell, and let it dry there: when you would use it, grinde it againe with Vineger or Verjuce, and a little neats gall dissolved in either of them. His false colour is two parts greene, and a third ceruse: it must bee sadded with a good greene.

A

A Mollie greene.

This colour is compounded of red and greene.

A blacke Colour.

First you muſt lay on a light blacke, mingled with white lead, and afterwards when it is dry, ſad it with good blacke; for ſad blacke, mixe Indie Baudias with Gumme water.

A marble or aſhe colour.

This is compounded of blacke and white.

A ruſſet or ſad Browne.

This colour is made by compounding a little white, with a good quantity of red.

A browne Blew.

Take two parts of Indie Baudias, and a third of ceruſe and temper them with gumme water.

A Braſſe Colour.

This is compounded of Maſticot and Vmber.

A gold yellow for Armes.

TAke Orpment, and Maſticot, grinde each by themſelves: but in grinding of the Maſticot, adde a little Saffron, and worke with them. Note you may alay your

Orpment with chalke, and fadde it with browne of Spain or Oker de Luke.

Azure.

TAke of white lead foure ounces, of Indicum two ounces, put them into a leaden pot with vinegar: boyle them well, and that which swimmes on the top is the colour.

A purple or violet Colour.

THis is a compounded colour, and it is made either by mixing a quantitie of Azure, and a portion of Turnsole: or else by mixing a quantitie of russet, and a quantitie of Azure.

Sanguine or Blood-colour.

THis is likewise a compounded colour, and it is made by mixing a good quantitie of Cinaper with a little Blacke.

Orange-tawny.

THis colour is compounded of a bright red, and a bright yellow.

A Lyon-tawny.

THis colour is made by mixing red lead and Masticot together.

A Carnation, or Fleſh-colour.

FIrſt you muſt lay on a white colour tempered with gumme-water, and when it is drie you muſt go it over againe with Vermillion or lake, or elſe you muſt temper ceruſe and vermilleon together, and being dry, go over it againe with lake or vermillion.

A Peach Colour.

This is compounded of Ceruſe and Vermillion.

A Skie Colour.

This colour is compounded of vermilleon and azure.

A Blood red.

THis colour is made of Cinaper, and afterwards ſadded with Vermilleon at the ſides, or elſe with a browne colour. A bloudy colour, grinde Cinaper, Lake, and Cinaper tops, put them into good water, and if they be too light, put to them a little Turnſole.

A Lincoln-greene.

THis colour is compounded of a good greene and Saffron.

A Poppin-jay greene.

This colour is compounded of azure, and maſticot.

A good yellow.

TAke Saffron, or Cambugium, and temper it with gum-water, Sad it with Vermilleon.

A sable or blacke.

TAke a Torch, hold it under a lattyn Bason, temper that blacke with gumme-water.

A velvet-blacke.

BVrne harts-horne on a Colliers hearth; then grinde it with the gaul of a neat, put it into a shell, and let it dry in the shade: when you would use it, grinde it againe with gumme-water.

To write gold with Pen or Pensil.

TAke a shell of gold, and put a little gum-water unto it, and temper it together, and then you may write with it as with other colours.

To make Azure, or bise sadder.

TAke blew Turnsole, wet it in gum-water, and then wring it out, and mixe it either with Bise, or else overshadow the Bise with it.

Red Colour.

TAke Vermillion, and temper it with gumme water: His false colour is two parts vermillion, and a third part cerose.

Another

Another Red.

TAke ruſſet, and temper it with gumme-water, eloy it with ceruſe, and ſad it with it ſelfe.

Another Red.

TAke Braſſill in groſſe powder, allum in powder: ſteep them in gum water a night and a day: then ſtraine it, and keepe it for uſe.

A greene Colour.

TAke Copper plates, put them in a copper pot, & put diſtilled vineger to them: ſet them in a warme place till the vinegar become blew, then put it out into another leaded pot, and poure more vinegar into it again, ſet it ſtand ſo till it become blew, this do ſo many times till you thinke you have enough: then let it ſtand till it be thicke.

To make good Inke.

TAke two handfuls of gauls, cut each gaul into three or foure peeces, poure into them a pint of beere or wine, then let it ſtand eight houres, ſtraine it from the gauls, and put vitreoll therein, and to the vitreoll a third part of gumme, ſet it on the fire to warme, but let it not ſeethe, and it will be good Inke, and of theſe gauls you may make Inke foure or five times more.

To

To ſeethe Braſill.

TAke an ounce of Braſill, twelve ounces of beere, wine, or vinegar, put it in a new pot, let it ſtand a night; and in the morning ſet it on the fire, and let it ſeethe till halfe be conſumed: then put into it two peny worth of allum beaten together, and as much beaten gum-Arabicke: ſtirre them well together, and let them ſeethe againe; if you deſire to have it ſomewhat darke, then ſcrape a little chalke into it when it ſeetheth: let it not ſeethe over the pot: when it is cold ſtraine it through a cloth, and put it into a glaſſe well ſtopt.

Aurum Muſicum.

TAke one ounce of Salarmoniack, one ounce of quick-ſilver of counterfeit, halfe an ounce of brimſtone, bruiſe the brimſtone, and ſet it on the fire, but let it not be over hot (leſt it burne) then take the Salarmoniacke, and the quickſilver being in powder: mixe them well together, then mingle with them the brimſtone: ſtirre them well, and quickly with a ſticke till the brimſtone become hard, then let it coole, grinde it on a ſtone, and put it in a glaſſe well ſtopt with waxe, and ſet it in a pan with aſhes; make a fire under it, and let it ſtand halfe a day in that manner (but not over hot) till a yellow ſmoke riſeth on it, and when the yellow ſmoke is gone it is prepared.

Argentum Muſicum.

TAke an ounce of Tynne, melt it, and put thereto one ounce of tartar, and one ounce of quickſilver, ſtirre them

them well till they be cold: then beat all in a morter, and grinde it on a ſtone; temper it with gumme-water, and write therewith, and afterward poliſh it.

To write a gold colour.

TAke a new hennes egge, make a hole at one end, and let the ſubſtance out, then take the yolke without the white, and foure times as much in quantitie of quickſilver; grinde them well together, and put them into the ſhell, ſtop the hole thereof with chalke, and the white of an egge, then lay it under an henne that ſitteth with ſixe more, let her ſit on it three weeks, then breake it up, and write with it.

To write with gold out of a Penſil.

TAke honey, and ſalt a like quantitie, grinde them well, and put to them a leafe of gold, with a little white of an egge; put it into a muſſell ſhell, and let it purifie; then temper it with gumme-water, and write with it, polliſh it.

Or elſe grinde a leafe of ſilver, or gold, very ſmall with gumme-water, and waſh it in a muſſell ſhell as aforeſaid.

To temper Azure of Biſe.

TAke Azure or Biſe, and grinde it on a ſtone with cleane water; then put it in a broad glaſſe, or ſhell, and when it hath ſtood a while all the dregs will fleet above, and the cleane colour will fall to the bottome; then poure out the water with the dregs, and poure the azure in

cleane water againe; then ſtirre the colour and water together, and let it ſtand, and ſine, and after that poure out the water, and dregs againe: do thus till it be well purged; then grinde it againe on a ſtone with gumme-water, and put it into a horne, or ſhell; when you paint or write, ſtirre it, and let the ſticke drop into the pen, for it will ſinke to the bottome as lead.

To temper Turnſole.

TAke Turnſole, and wet it once or twice in cleare water, and let it lye till it be well ſteeped; then wring it into a diſh till the colour be good, and ſad; with this you may flouriſh red letters, or veſtures, and this colour ſhall be darked, ſadded, or renewed with blacke inke.

To make colouring, called Vernix: to varniſh gold, ſilver, or any other colour on vellum, paper, timber, ſtone, &c.

TAke Bengewine, and bray it well betwixt two papers, then put it into a viol, and poure on it *Aqua vitæ*, that it may ſtand aboue the bengewine three or foure fingers, and let it ſteepe ſo a day or two; then put to it for halfe a violl of *Aqua vitæ* fiue or ſixe chieues of Saffron ſlenderly ſtamped; this done, ſtraine it, and with a Penſil verniſh therewith any thing gilded, which will become bright and ſhining, drying it ſelfe immediately, and will continue the brightneſſe many yeares; But if you will varniſh on ſiluer, then take the white that is found in Bengewine and dreſſe it with *Aqua vitæ* as afore, leauing out the Saffron, and the ſaid verniſh made with theſe onely

onely is very good to varniſh all things as well painted, as not painted: for it maketh Tables of Walnut tree and Hebene to gliſter if it bee laid on them, and all other things, as Iron, Copper, or Tin gilded, or not: it maketh bright, preſerveth and aideth the colour, and dryeth incontinent without taking duſt.

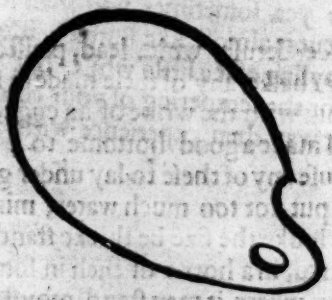
To make a double ſize to lay gold or ſilver on an embоſſed ground.

TAke Venice Ceruſe, white lead, plaiſter of an old Image, or chalke, any of theſe made in fine powder, and ground with the white of an egge, and a little water: this will make a good bottome to lay ſilver on. But when you uſe any of theſe to lay under gold, put to it a little Saffron, put not too much water; mingle it after diſcretion, and looke the ſize be thicke ſtanding: put the ſize thus tempered, in a horne or ſhell in ſome Celler, or ſhadowed place, where it may ſtand moyſt ſeven dayes, till it be perfect clammy and rotten, and once a day ſtirre it; the elder the ſize is, it is the better. If there ſtand any bubbles on the ſize, put in care waxe, for that is a remedy thereto, and before you lay it on your worke, lay the ſize on a ſcrow, and dry it, and when it is dry, bend it, and if it bend and breake not, then it is perfect, and if it breake, put to it a little water to make it weaker, and proue if it cleaueth faſt to the booke, if not, put glayr thereto, and make it more ſtedfaſt: the like ſize may you make of Gipſium, Bolearmoniacke, red or yellow Oker, Orpment or Maſticot, with browne of Spaine, or red lead: if euery of them be ground ſeuerally, and tempered as afore.

Of painting in Oyle.

HEre you muſt provide one thing more then you did before: that is, a Pallet (ſo called by Artiſts) whereupon you muſt put a ſmall quantitie of euery ſuch colour you are to uſe, the forme whereof followeth.

The Pallet.



The colours to be uſed, are altogether ſuch dry ſubſtances as I mentioned formerly: as Oker, Vermilion red lead, Vmber, Spaniſh browne, Lam-blacke, Gambugice, Maſticot, Orpment, Ceruſe, or Spaniſh white, blew and greene Biſe, Verdigreaſe, and a multitude of ſuch like, which may be had at the Roſe in *Cornehill, London.*

Your colours muſt be ground all very finely, and tempered with Linſeed oyle; and to preſerve them, put them in little earthen pans, and put water upon them, and cover them, that the duſt come not at them: thus they may

be

be kept a great while, and from thence you may take them as your uſe doth require.

There are divers colours which without the admixture of another colour, will not be dry a great while; as Lake, Verdigreaſe, Lam-blacke: with ſuch you muſt temper a little Vmber or red lead.

Divers Painters there are, that having haſte of worke, doe uſe to temper their colour with one part of fatte oyle, and two of common Linſeed oyle, and by this meanes they make the colours dry the ſooner: this fat oyle is onely Linſeed oyle expoſed to the weather, and ſo it becommeth thicker: yea ſometimes you ſhall ſee it ſo thicke, that you may cut it almoſt like Butter: it may bee made likewiſe by boyling of it a little while, but the former is the beſt. As for the tempering of your colours, I can preſcribe no ſurer way then experience with diligent obſervation.

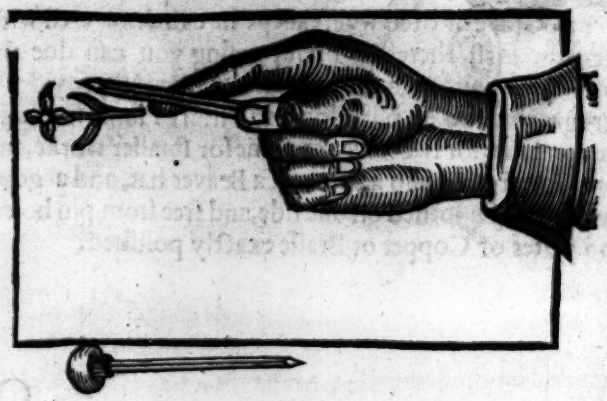
Of Graving.

IT is possible for one to be a good Painter, and yet not to be able to draw well with the pen, because there is not required in a Painter such a curious and exact carriage of the hand: but it is impossible for one ever to Grave or Etch well, except he can draw well with the pen. First therefore presupposing you can doe the first before you attempt the second, you must provide divers graving tooles, both long and short: some for hard worke, some for sweet worke, some for smaller worke, and some for greater: also a peece of a Beaver hat, and a good oyle stone, smoothed on one side, and free from pin holes, and plates of Copper or Brasse exactly polished.

Of

Of Gravers.

THere are two principall ſorts of Gravers, the long and the ſhort: the long are ſtraight, and for to engrave Plates withall, eſpecially the greater, and theſe are to be held as the figure following doth expreſſe: where you may note that the pummell of the Graver



reſteth againſt the ball of the thumb, and the point is guided with the forefinger. And there ought to bee a little bagge of ſand under your Plate, to the end that you

you might turne your plate upon it as your worke doth require.

The second sort is a short Graver, and turneth up somewhat at the end, and that is to engrave Letters and Scutchions in plate seales, and smaller plates, being fastened in some convenient instrument: this must be held likewise according unto the expression of the figure following: where it is to be noted, that the pummell of the Graver is stayed against the further part of the hand, and

is guided by the inward side of the thumbe. It were needfull that there were a piece of leather like a Taylors thimble, about the end of the thumbe, waxed or glued, whereby to guide the Graver more steadily, and stay it upon occasion.

How to make Gravers.

PRovide ſome good croſſe-bow ſteele, and cauſe it to be beaten out into ſmall rods, and ſoftned: then with a good file you may ſhape them at your pleaſure: when you have done, heat them red hot, and dip them ſtraight downe into ſope, and by ſo doing, they will bee hard indeed. Note that if in the dipping of them into the ſope, you turne your hand never ſo little awry, the Graver will be crooked. Theſe Gravers made and hardened after this manner, doe farre exceed all the other Gravers.

If your gravers be too hard, heate them a little, and thruſt them into tallow, and they will be tougher.

The oyle ſtone is to whet your gravers on; drop one or two drops of ſallet oyle upon it, and whet your graver thereon, and it will have an edge preſently.

How to ſmooth and polliſh Copper Plates.

BEcauſe that in the printing with Copper Plates, the leaſt ſcratch, though it be ſcarce viſible, receiveth his impreſſion, and ſo many times diſgraceth the worke: I have ſet downe a way to ſmooth plates for impreſſion.

Firſt, take a piece of Braſſe, or Copper, of what bigneſſe you intend, of an indifferent thickneſſe, and ſee as neere as you can, that it bee free from fire flawes. Firſt beat it as ſmooth as you can with a hammer, then rub it ſmooth

ſmooth with a pumice ſtone that is void of gravell, (leaſt it race it, & ſo cauſe you as much more labour to get thē out) burniſh it after with a burniſhing iron, having firſt dropped a drop or two of ſallet oyle on it: then rub it over with a cole, prepared as is after taught, and laſtly with a peece of beaver hat dipt in ſallet oyle, rub it very well for an houre: thus you may poliſh it exactly.

How to prepare your Coales.

TAke Beechen charcole, ſuch as when they are broke, doe ſhine, ſuch as are void of clifts, and ſuch as breake off even: burne them againe, and as ſoone as they are all through on fire, quench them in chamber lye: after take them out, and put them in faire water, and reſerue them for your uſe.

Having prepared all things in a readineſſe, you muſt haue a draught of that you intend to cut or engrave.

Take the plate then, and waxe it lightly ouer, and then either pounce the picture upon it, or trace it, or by drawing ouer the lines of the picture with ungummed inke, reprint it upon the Plate: then worke upon it, obſeruing the ſhadow, ſo that being printed, it may ſtand right, for it will be backward upon your plate: when you haue cut one ſtroke, drop a little ſallet oyle upon your peece of Bever, and rub over the ſaid ſtroke, for by this meanes you ſhall better ſee the ſtroke, and how to cut the next equall unto it, and ſo the reſt proportionally diſtant one from another; but to worke by a Candle, you muſt place a glaſſe of faire water betweene the Candle, and a paper betweene that

and the Plate, (which casteth a true light) or you will never be able to worke truely and aright.

Of Etching.

ETching is an imitation of engrauing, but more speedily performed. Things may be expressed to the life thereby, but not so sweetly as by the Graver. It is thus performed: the Plate you are to etch upon, must first exactly be polliſhed, afterwards ouerlaid but very lightly with a ground made for the purpose, (of which anon) and thereupon must be pounced, drawne, or traced, the thing that you are to etch: then the said ground is to be pierced with diuers stiles of seuerall bignesse according as the shadowes of the picture doe require: afterwards the edges of the Plate are to be raised with soft waxe and strong water, (for so they terme it) (It is to be had at the signe of the Legge in *Foster Lane* a Distiller) is to be put upon it, which in those places were the strokes, are required to be lightly performed, is to be abated or alayed with faire water, which hauing dured a while upon the plate, will eate into it, as it were engraven, then put it into cold water, and wash it about, and it will leaue eating further, and then take off the ground and it is done.

A

A red ground for Etching.

Take red lead, grinde it very well, and temper it with varnish.

A white ground.

TAke one ounce of Waxe, and two ounces of Rosin, melt them together, and adde thereto a quarter of an ounce of Venice Ceruse ground fine, lay it on while it is hot.

A blacke ground.

TAke Asphaltum two parts, Bees waxe one part; melt them together, and being warme, lay it on very thinly with a fine lawne ragge. If it seeme somewhat red in any one part, hold it over the smoake of a Linke or waxe candle, and it will be amended. Note that it is a principall thing in this Art to lay the ground on aright.

Another way how to engrave with water.

TAke Verdigrease, Mercury sublimated, vitreoll, and allum, a like quantity, beate all to powder, put them into a glasse, and let it stand so halfe a day, and stirre it often, then lay on the plate, waxe, mingled with Linseed oyle, or red lead with Linseed oyle, and write in it

that you meane to grave, then put the water on it, and let it so remaine halfe a day, if you will have it very deepe, let it lye longer. If you will engrave Images, &c. lay the waxe on the Iron or Steele, thin, and draw what you will theron, that it may touch the mettall, then put the water into the strokes, and it will be engraven.

How to engrave on a flint stone.

TAke a Flint, and write on it what you will, with the fat or tallow of an Oxe, afterward lay the flint in vineger, foure dayes.

FINIS.

THE BOOKE OF EXTRAVAGANTS:

VVherein amongst others, is principally contrived divers excellent and approved Medicines for severall maladies.

By *I. B.*

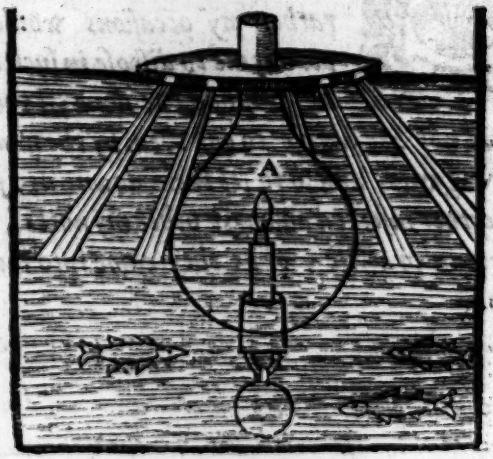
LONDON.
Printed by *Thomas Harper*, for *Ralph Mab*: 1634.

To the Reader.

COurteous Reader, forasmuch as there were divers experiments that I could not conveniently, or rather my occasions would not permit me to dispose in such order as I would have done; I thought it would not bee amisse to call them by the names of Extravagants, *and so to set them downe as I found them, eyther inserted amongst other my notes, as I put them in practise, or as they came into remembrance.*

How to make a light burne under the water, being a very pretty conceypt to take fish.

LEt there be a glasse, as A, having a hole at the bottome, to put a candle in with a screwed socket. The socket must have a loope at the bottome, whereunto you must hang a weight of such heavinesse, that it may draw the body of the glasse under water. The necke of this glasse must bee open, and stand above the water; also a.



bout the necke must bee fastened a good broad peece of wood; round about which (but on that side of it that is next unto the water) must be placed divers peeces of looking glasses; so the light of the candle in the glasse body will

will bee multiplied according unto the number of them. All the fiſhes neere unto it will reſort about it, as amazed at ſo glorious a ſight, and ſo you may take them with a caſt net or other.

How to make an image hang in the middle of a glaſſe.

MAke the lower part of the image of hard wax, and the upper part of wood, and overlay it with oyle colours; then put it into a globe glaſſe filled with fayre water, and which way ſoever you turne the glaſſe, the image will ſtill hang in the middle, and ſtand as it were upright; which, to my knowledge, hath been a thing cauſing no ſmall admiration among divers that have not underſtood the cauſe of it.

How to make five or ſix dice of the ordinary bigneſſe of dice, ſuch as you may game withall, and ſuch as would be taken by their lookes to bee ordinary dice, and yet all of them to weigh not above one grain.

TAke a peece of Elder, and pith it, lay the pith to dry, and then make thereof with a ſharp knife five or ſix dice, and you ſhall finde it true that I haue ſayd.

To lay gold on any thing.

TAke red Lead ground firſt very fine, temper it with linſeed oyle: write with it, and lay leafe gold on it, let it dry, and polliſh it.

To lay gold on glasse.

GRinde Chalk, and red Lead, of each a like quantity, together, temper them with linseed oyle, lay it on; when it is almost dry, lay your leafe gold on it, when it is quite dry polish it.

To make yron as soft as lead.

TAke black flints, powder them very finely; then put the powder in an iron pan, and make it red-hot, then cast it on a marble stone, till it be almost cold, then make it red-hot againe, and let it coole, and grinde it so long till it cleave to the stone, and grinde as it were clay; then put that in a glasse, and set it under the eaves of a house, where the Sunne commeth not nigh in the day, then the night after take out the water that you shall finde in the glasse above the powder, then take that powder and grinde it with the water, and put it in a stillatory, and let it still out the halfe; afterward poure the water againe on the sayd powder, and still it againe with a soft fire; then take and seethe that water till the halfe bee wasted, then take some iron blade that is new broke, and put it together, and hold it so a little while; then take of the water which was sod to the half, and with a feather lay it first to the one side of the blade, and when the water is cold, lay it on the other side, and it will soder fast with this water; and with this water you may make steele as soft as lead. It is likewise a soveraigne water to help the gout, being anoynted where the griefe is, for it giveth ease very speedily.

To

To colour tin, or copper, &c. of a golden colour.

TAke linſeed oyle, ſet it on the fire, ſcum it cleane, then put therein of amber, and aloe hepaticum, a like quantity, then beat and ſtir all well together with the oyle till it wax thick; then take it off, and cover it cloſe, and ſet it in the earth three dayes: when you would uſe it, ſtrike your metall all ouer therewith, and ſo let it dry, and it will be of a golden colour.

To gild iron with a water.

TAke running water 3 pound, rochallum 3 pound, and Roman vitreoll one ounce, of vardigreaſe one penny waight, ſaltgem three ounces, orpment one ounce, boyle all theſe together, and when it begins to boyle, put in lees of tartar and bay ſalt, of each halfe an ounce; make it ſeethe, and being ſod a pretty while, take it from the fire, and ſtrike the iron over therewith, then let it dry againſt the fire, and then burniſh it.

To ſoder on iron.

SEt your joynt of iron as cloſe as you can, then lay them ſo in a glowing fire; then take of Venice glaſſe in fine powder, and the iron being red-hot, caſt the powder thereon, and it ſhall ſoder of it ſelfe. If you clap it in clay, it will be the ſurer way.

To gild on iron or ſteele.

TAke one ounce of argall, three drammes of vermileon, and two drams of bol armeniack, with as much aqua vitæ, then work and grinde them all together on a ſtone, with linſeed oyle; having ſo done, put thereto lapis calaminaris as big as a hazell nut, and grinde therewith in the end three or foure drops of varniſh; take it off the ſtone, and ſtrain it through a linnen cloth into a ſtone pot, (for it muſt bee as thick as hony) then ſtrike over your iron therewith, and let it dry, and then lay your gold or ſilver on, as you would do upon the varniſh.

A varniſh like gold, for tin, ſilver, or copper.

TAke ſmall pots well leaded, then put therein ſix ounces of linſeed oyle, one ounce of maſtick, one ounce of aloes epaticum; make them altogether in fine powder, and then put it into your layd pot, and cover it with ſuch another; yet in the bottom of the uppermoſt pot make a ſmall hole, wherein put a ſmall ſtick with a broad end beneath to ſtir the other pot withall, and when the pots are ſet juſt together, cloſe them all about with good clay, and couer them all over alſo, leaving the hole open above to ſtir the other pot with the ſtick: ſet it over the fire, and ſtir it as often as it ſeetheth, and when you will gild, polliſh your metall over firſt, and then ſtrike this over the metall, and let it dry in the Sunne.

To

To lay Gold on Iron, or other mettall.

TAke liquid Varniſh l. 1. Turpentine, & oyle of Lynſeed, of each an ounce: mixe them all together: with this ground you may gild on any mettall, firſt ſtriking it upon the mettall, and afterward lay on the gold or ſilver. When it is dry, poliſh it.

To make Ice that will melt in fire, but not diſſolve in Water.

TAke ſtrong water made with ſaltpeter, allum, and oyle of tartar, of each, one pound. Infuſe them together, then put into them a little *aqua ardens*, and it will preſently coagulate them, and turne them into ice.

A cement as hard as ſtone.

TAke powder of Loadſtone, and of flints, a like quantity of either, and with whites of egges, and gumme dragant, make paſte, and in a few dayes it will grow as hard as a ſtone.

To make Paper waved like unto marble.

TAke divers oyled colours, put them ſeverally in drops upon water, and ſtirre the water lightly, and then wet the paper (being of ſome thickneſſe) with it, and it will be waved like a marble: dry them in the Sun:

To make Copper or Braſſe have the colour of ſilver.

TAke *Sal Armoniacke*, allum, and ſalt, of each a like quantity, and with a little filings of ſilver, let all be mixt together, then put them into the fire, that they may be hot, and when they ſhall ceaſe to ſmoke, then with the ſame powder moyſtned with ſpittle, rub your Copper or Braſſe.

How to make glew to hold things together as faſt as ſtone.

TAke of the powder of tile ſheard, two pound, unſlakt lyme, foure pound, oyle of Lynſeed, a ſufficient quantity to temper the whole mixture; this is marvellous ſtrong.

To make a thinne glew.

TAke *gluten piſcis*, beate the ſame ſtrongly on an Anvill, till it be thin, after lay it to ſoke in water, untill it be come very ſoft and tender: then worke it like paſte, to make ſmall rowles thereof, which draw out very thinne, and when you will worke with it, put ſome of it into an earthen pot, with a little water, over the embers, and skim the ſame very cleane, and let it ſeeth a little while, then worke with the ſame: keeping it ſtill over the fire. With this glew you may faſten peeces of glaſſe together.

To make Iron have the colour of Braſſe.

FIrſt, poliſh it well, rub it after with *aqua fortis*, wherin the filings of braſſe are diſſolved: the like may bee done with Roman vitrioll diſſolved in vineger and faire water, of each a like quantity.

To make wood or bone red for ever.

TAke the powder of Brazill, mingle it well with milke, but ſo, that it be very red, and put therein, either wood or bone, letting it lye in eight dayes, and it will looke red for ever.

How with one Candle to make as great a light, as otherwiſe of two or three of the ſame bigneſſe.

CAuſe a round and double glaſſe to be made, of a large ſize, and in faſhion like a globe, but with a great round hole in the top, and in the concave part of the uppermoſt glaſſe, place a candle in a looſe ſocket, and at the ſame hole or pipe which muſt be made at the ſide thereof, fill the ſame with ſpirit of wine, or ſome other cleere diſtilled water that will not putrifie, and this one candle will give a great and wonderfull light, ſomewhat reſembling the ſunne beames.

A Cement for broken Glaſſes.

BEate the whiteſt Fiſh glew with a hammer, till it begin to waxe cleere, then cut the ſame into very ſmall pieces, ſuffering the ſame to diſſolve on a gentle fire, in a lea-

ded pan, with a few drops of *aqua vitæ*, then let some other that standeth by, hold both the pieces that are to bee cemented, over a chafingdish of coles, till they be warme: and during their heat, lay on the dissolved glew with a fine pensill: then binde the glasse with wyre or threed, and let it rest till it be cold.

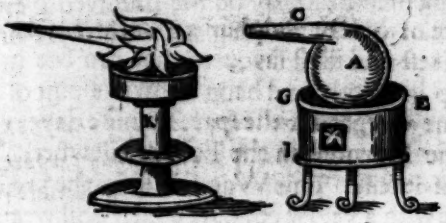
An admirable secret of representing the very forme of Plants, by their ashes, philosophically prepared, spoken of by Quercitanus *and* Angelus salæ.

TAke saith hee, the salt both the fixed and the volatill also. Take the very spirit, and the phlegme of any herbe, but let them all be rightly prepared; dissolve them, and coagulate them, upon which if you put the water stilled from May dew, or else the proper water of the herbe you would have appear, close them all very well in a glasse for the purpose, and by the heat of embers, or the naturall heat of ones body, at the bottome of the glasse, the very forme and Idæa thereof will be represented: which will suddenly vanish away, the heat being withdrawne from the bottome of the glasse. As I will not argue the impossibility of this experiment, so I would be loth to employ mine endeavours, untill I were expert therein.

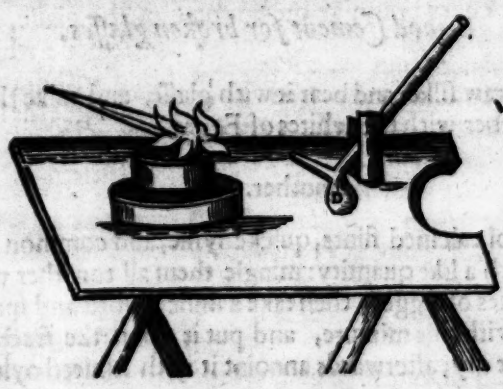
A device to bend glasse Canes, or make any small worke in Glasse.

LEt there be a vessell of Copper about the bignesse of a common Foot-ball, as, A, let it have a long Pipe at the top as G. which must be made so that you may upon occasion screw on lesser, or bigger vents made for the

the purpoſe. Fill this one third part with water, and ſet it over a fornace of coals, as F, G, H, I, and when the water beginneth to heat, there will come a ſtrong breath out of



the noſe of the veſſell, that will force the flame of a lampe placed at a convenient diſtance as K: if you hold your glaſſe in the extention of the flame it will melt ſuddenly; ſo you may worke what you will thereof. There are that inſtead of this globe make uſe of a Pipe, as A, faſtned in a



ſticke as, F, of which I have made uſe, but hold it not ſo convenient for thoſe that are not accuſtomed thereunto.

An excellent Water for any Morphue, or ſcurvineſſe in the Face.

TAke of quicke Sulphur 2. ounces, blacke Sope, the rankeſt and illeſt favoured that can bee got: binde them up in a cloth, and hang them in a pint of the ſtrongeſt wine vineger for the ſpace of nine dayes; herewith waſh the Morphue in the Face or elſewhere, and let it dry in of it ſelfe: This Water will for the preſent ſtaine the face with a yelow collour, which will weare away in time.

How to ſoften Iron.

TAke of Allum, ſal Armoniacke, Tartar, a like quantitie of either, put them into good vineger, and ſet them on the fire: heat your Iron, and quench it therein.

A good Cement for broken glaſſes.

TAke raw ſilke, and beat it with glaſſe, and mixe them together with the whites of Egges.

Another.

TAke of calcined flints, quicke lyme, and common ſalt, of each a like quantity: mingle them all together with the whites of Egges; then take a linnen cloth and ſpread it over with this mixture, and put it upon the fracture, and let it dry; afterwards annoint it with Linſeed oyle.

How

How to cauſe that the ſame quantitie both of powder and ſhot diſcharged out of the ſame peece ſhall carry cloſer, or more ſcattering.

TAke the quantitie of a peaſe of Opium, and charge it amongſt the ſhot, and this will make the ſhot to flie cloſer together then otherwiſe it would. This I had of a Sea-man, who had made triall hereof, as he ſaid, and unto whom I ſold ſome for the ſame purpoſe.

A Baite to catch Fiſh with.

TAke *Coccului Indie* ℈ ſs, Henbane-ſeeds, and wheaten flower, of each a quarter of an ounce, hive honey as much as will make them into paſte. Where you ſee moſt ſtore of Fiſh in the River, caſt of this paſte into it in divers little bits about the bigneſſe of barley cornes, and anon you ſhall ſee the fiſh ſwimme on the top of the water, ſome reeling to and fro as drunken, others with their bellies upwards as if they were nigh dead; ſo that you may take them either with your hands, or a ſmall net at the end of a ſticke made for the ſame uſe. Note here, that if you put the Fiſh that you thus take, into a bucket of faire and freſh water, or if it raine after that you have caſt this your bait into the water, they will revive and come to themſelves to your admiration; and this was told me by a Gentleman of good credit, that hath often made uſe thereof.

I have heard that the ſtinking oyle drawne out of the roots of Polipody of the oake by a retort, mixed with Turpentine, and hive-honey, and being anointed upon the

the bait will draw the fish mightily thereto, and make them bite the faster: and I my selfe have seene fishes, as Roches, and taken in the dead time of Winter with an angle, bayted onely with paste made of Wheaten flowre, but it hath beene in the morning, and when the Sunne hath shined.

How to write without inke that it may not be seene, unlesse the paper be wet with water.

TAke some Vitriol, and powder it finely, and temper it with faire water in any thing that is cleane, when it is dissolved, you may write whatsoever you will with it, and it cannot be read, except you draw it through water wherein some powder of galls hath beene infused, and so it will shew as blacke as if it had beene written with inke.

How to make white letters in a blacke Feild.

TAke the yelke of a new layd egge, and grinde it upon a marble with faire water, so as you may write with it: having ground it on this wise, then with a penne dipt into it, draw what letters you will upon paper, or parchment, and when they are through drie, blacke all the paper over with inke; and when it is drie, you may with a knife scrape all the letters of that you wrote with the yelke of the egge, and they will shew faire and white.

How to sodder upon Silver, Brasse, or Iron.

THere are two kindes of Sodder, to wit, hard Sodder, and soft Sodder. The soft Sodder runneth sooner then the

the hard: wherefore if a thing be to be ſodered in two places, which cannot at one time well be performed, then the firſt muſt be ſodered with hard ſoder, and the ſecond with ſoft: for if the firſt be done with ſoft, it will unſoder againe before the other be ſodered. Note, that if you would not have your ſoder to runne over any one part of the peece to be ſodered, you muſt rub over that part with chalke that you would not have it runne upon.

Note likewiſe that your ſoder muſt be beaten thinne, and then laid over the place to be ſodered, which muſt be firſt fitted together, and bound with wyer as occaſion ſhall require. Then take Burras, powder it, and temper it with water like pap, and lay it upon the ſoder, and let it drie upon it by the fire: Afterwards cover it with quicke coals, and blow them up, and you ſhall ſee your ſoder run immediately: then preſently take it out of the fire, and it is done.

Hard Soder is thus made.

TAke a quarter of an ounce of ſilver, and a three penie weight of copper, melt them together, and it is done.

Soft Soder is thus made.

TAke a quarter of an ounce of ſilver, and a three penie weight of braſſe, melt them together, and it is done.

How to gild Silver, or Braſſe, with water-gold.

FIrſt take about ʒ. ii. of quicke ſilver, put it into a little melting pot, and ſet it over the fire, and when it begin-

neth to ſmoke, put into it an angel of fine gold: then take it off preſently for the gold will preſently be diſſolved in the quicke-ſilver, which if it be too thinne, you may through a peece of fuſtian ſtraine a part of the quicke-ſilver from it. Note likewiſe that your ſilver, or braſſe, before you go about to gild it, muſt be boyled in argol, and beare, or water, and afterwards ſcratcht with a wyer bruſh: then rub the gold, and quicke-ſilver upon it, and it will cleave unto it, then put your ſiluer or braſſe upon quicke coales untill it begin to ſmoke: then take it from the fire, and ſcratch it with your wyer bruſh: Do this ſo often till you have rubd the quicke-ſilver as cleane off as you can, then ſhall you perceive the gold to appeare of a faint yellow colour, which you may make to ſhew faire with ſal armoniacke, bole armoniacke, and vardigrece ground together, and tempered with water.

How to take the ſmoake of Tobacco through a glaſſe of water.

FIrſt fill a pinte glaſſe with a wide mouth, almoſt full of faire water: fill alſo a pipe of Tobacco, and put the pipe upright into the glaſſe of water, ſo that the end of the pipe may almoſt touch the bottome of the glaſſe: then take another crooked pipe, and put it into the glaſſe, but let the end thereof not touch the water: waxe then the mouth of the glaſſe, that no ayre may come in nor out, but at the pipes: then put fire unto the Tobacco, and ſucke with your mouth, at the end of the crooked pipe, and you ſhall ſee the ſmoake of the Tobacco penetrate the water, and breake out of a bubble, and ſo come into your mouth.

To colour Ivory or any other bones, of an excellent greene colour.

TAke *aqua fortis*, wherein diſſolue as much Copper, as the ſaid water is able, then let the bones that you would haue coloured, lye in the ſame all night, and they will be like a Smaragdin colour: *Mizaldus.*

How to make birds drunke, ſo that you may take them with your hands.

TAke ſuch meate as they loue, as Wheate, Barley, and lay the ſame to ſteepe in the lees of Wine, or elſe in the juyce of Hemlockes, and ſprinckle the ſame in places where Birds uſe to haunt.

A way to catch Crowes.

TAke the Liuer of a Beaſt, and cut it in diuers pieces, put then into each piece, ſome of the powder of *nux vomica*, and lay theſe pieces of Liuer in places where Crowes and Rauens haunt. Anon after they haue eaten them, you may take them with your hands, for they cannot flye away.

How to take Crowes or Pigeons.

TAke white Peaſe, and ſteepe them eight or nine daies in the Gall of an Oxe: then caſt the ſame where they uſe to haunt.

You may make Partridges, Duckes, and other birds drunke, ſo that you may take them with your hand: if

you ſet blacke wine for them to drinke in thoſe places whereunto they reſort.

Another.

TAke Tormentill, and boile it in good wine: put into it Barley or other graine: Sprinckle this in thoſe places you haue appointed to take Birds in, and the Birds will eate the pieces amongſt the graine, which will make them ſo drunke, that they cannot flye away. This ſhould be done in the winter, and when it is a deepe ſnow.

Another way to take Birds.

MAke a paſte of barley meale, onion blades, and Henbane ſeeds: ſet the ſame upon ſeuerall little boards, or pieces of tiles, or ſuch like, for the birds to eate of it.

How to make Braſſe white for euer.

TAke Egge ſhels, and burne them in a melting pot: then powder them, and temper them with the whites of Egges; let it ſtand ſo three weekes: heate your braſſe red hot, and put this upon it.

How to make Marble.

TAke ℥ vj. of quicke Lime, put it into a pot, and poure upon it, one pinte of good wine: let it ſtand fiue or ſixe dayes, ſtirring it once or twice a day: then poure off the cleare, and therewith temper flint ſtones calcined, and made into fine powder, then colour it, and make of it what you pleaſe, and let them dry.

How

How to whiten copper.

TAke a thin plate of copper, heat it red-hot divers times, and extinguish it in common oyl of tartar, and it will be white.

To make Saltpeter.

TAke quick lyme, and poure warm water upon it, and let it stand six dayes, stirring it once or twice a day: take the cleare of this, and set it in the Sunne untill it bee wasted, and the Saltpeter will remaine in the bottom.

How to make Corall.

TAke of red Lead ground, ℥ 1. vermilion finely ground, ℥ ſs. unquenched lyme, and powder of calcined flints, of each ℥ vj. these powders must bee tempered with a *Lixivium* that is made with quick lyme and wine: adde unto the whole a little salt; then make thereof what you list; then boyle them in linseed oyle.

How to make Pearles of Chalk.

TAke some Chalk, and put it into the fire; there let it lie untill it break: temper it then with the whites of eggs. Then make of it divers fashions of Pearles, both

great and ſmall: wet them being dried, and cover them with leaſe gold, and they are done.

An approved and excellent plaſter for ach in the raines of the back, or in any other part whatſoever.

TAke one pound of black Sope, and foure ounces of frankincenſe, and a pinte of white wine vineger: boyle all together upon a gentle fire, untill it be thick; ſpread it then upon a lether, and apply it unto the grieved place. If the ach bee very great and fervent, then adde unto it a little *aqua vitæ*, and it will be much better.

An excellent oyntment for the Shingles, Morphew, Tetters, and Ringwormes.

TAke a quarter of a pound of ſope, and mingle with it two drams of the powder of black Ellebor, litharge of ſilver in fine powder, two ounces, verdigreaſe halfe an ounce, and a quarter of an ounce of glaſſe in powder, and as much quickſilver, make them all into an oyntment by ſtirring them well together, wherewith anyont the grieved parts. This is approved and true.

An

An excellent Balme, or water for grievous ſore eyes, which commeth either of outward accident, or of any inward cauſe.

TAke two ſpoonfuls of the juyce of Fennell, and one ſpoonfull and a halfe of the juyce of Celandine, and twice as much hony as them both; then boyle them a little upon a chafingdiſh of coales, and ſcum away the dregs which will aſcend, but firſt let it coole ſomwhat, and then let it run through a fayre cleane cloth: then put it into a violl of glaſſe, and ſtop it cloſe. Put a little quantity of this into the eye. This medicine is approved, and more precious than gold.

A ſpeedy way to aſſwage the paine of any ſcald, or burne, though never ſo great, and to take the fire out of it.

TAke old lawn rags, dip them into Runnet, for want of it dip them into verges, and apply them cold upon the grieved place, ſhifting them for halfe an houre together, as oft as they dry: this I have known to give eaſe in an inſtant, and quickly to take out the fire.

An approved oyle for to heale any burne or ſcald.

TAke of houſleek one handfull, and of brooklime as much, boyle them in a quart of creame untill it turne unto

unto an oyle; boyle it very gently: with this oyle a little warmed, anoint the grieved place twice a day, and it will ſoone make it well.

An oyntment, very excellent and often proued, for the ſame.

TAke a good quantity of moſſe ſcraped from off a ſtone wall, fry it in a fryingpan with a call of mutton ſuet a good while, then ſtraine it, and it is done. Dreſſe the grieved part therewith once or twice a day, as you ſhall ſee fitting.

Another oyntment for a burne.

TAke one part of ſallet-oyle, and two parts of the whites of egs, beat them together exceeding well, untill they come to be a white oyntment, wherein dip the feather of a black hen, and anoynt the grieved place diuers times every day, untill ſuch time as the ſcales fall off, uſing in the meane while neither clothes nor any outward binding. This, ſayth *Miſſhet* the authour, though it ſeeme to be a thing of no eſtimation, yet was there never found any more effectuall for a burn than it is.

An excellent oyntment for a green wound.

TAke foure hand fuls of Clownes, Allheale, bruſe it, and put it into a pan, and put to it foure ounces of barrowes greaſe, ſallet-oyle halfe a pound, Bees wax a quarter of a pound,

pound; boyle them all untill the iuyce be waſted; then ſtraine it, and ſet it over the fire againe, and put unto it two ounces of Turpentine, then boyle it a little while more, and it is done. Put hereof a little in a ſaucer, and ſet it on the fire, dip a tent in it, and lay it on the wound, but firſt lay another plaiſter round about the wound, made of diapalma mollified a little with oyle of Roſes: This cureth very ſpeedily all greene wounds, as ſaith M. *Gerard.*

A Balſam of wonderfull efficacy.

TAke Burgundie pitch, brimſtone, and white frankincenſe, of each one ounce: make them into an oyntment with the whites of egges: firſt draw the lips of the wound, or cut, as cloſe as you can, then lay on ſome of this ſpread upon a cloth, and ſwathe it ouer afterwards.

An excellent healing Water, which will drie up any old ſore, or heale any greene wound.

TAke a quarter of a pound of Bolearmoniacke, powder it by it ſelfe, then take an ounce of Camphire, powder it alſo by it ſelfe: alſo take foure ounces of white Coppras in powder: mixe the Coppras and Camphire together, and put them into a melting pot, and ſet them on the fire, untill they turne unto water: afterwards ſtirre it untill it come to be as hard as a ſtone: then powder it againe, and mixe it with the Bolearmoniacke: keepe this powder cloſe in a bladder, when you would uſe it, take one pinte and a halfe of faire water, ſet it on the fire, and when it is even ready to boyle,

put into it three ſpoonfuls of the powder; then take it off from the fire, and put it into a glaſſe, and let it ſtand untill it be cleare at the top, then take of the cleareſt, and waſh the ſore very warme therewith, and dip a cloth foure double in the ſame water, and binde it faſt about the ſore with a rowler, and keepe it warme: dreſſe it thus twice a day.

A Water for a Fiſtula.

TAke one pint of white wine, 1 ounce of juyce of Sage, three penie weight of Borace in powder, Camphire in powder the weight of foure pence: boyle them all a prettie while on a gentle fire, and it is done: Waſh the Fiſtula with this water, for it is certainly good, and approved to be true.

A Water for the Toothache.

TAke ground ivie, ſalt, and ſpearemint, of each an handfull: beat them very well together, then boile them in a pint of vineger; ſtraine it, and put a ſpoonfull of it into that ſide that aketh, and hold downe your cheeke.

Another Water approved for the ſame.

TAke red roſe leaves halfe a handfull, Pomegranate-flowers as many, two gaules ſliced thinne: boyle them all in three quarters of a pint of red wine, and halfe a pint of faire water untill the third part be waſted: then ſtraine it, and hold a little of it in your mouth a good while;

while: then ſpit it out, and take more. Alſo if there be any ſwelling on your cheeke, apply the ſtrainings betweene two clothes as hot as may be ſuffered. This I have knowne to do good unto divers in this Citie, when as they have beene extreamely pained.

To make a Water for the eyes.

TAke *Lapis Calaminaris*, and burne it in the fire nine times, and quench it in white wine, and beat it into powder, and when you uſe it, put it into roſe-water, and drop the water into the eye.

For Deafeneſſe.

TAke a good quantitie of Camomill, and two handfuls of greene Wormewood, and ſeethe them in a pot of running water till they be very well ſodden, and put a funnell over it, and let the ſteame go up into the eare, and then go to bed warme, and ſtop your eare with a little blacke wooll, and a grain of Civet: do this morning and evening, and with Gods aſſiſtance you ſhall finde eaſe.

An excellent Electuary for the Cough, Cold, or againſt Flegme.

TAke of Germander, Hiſſope, Horehound, white Maidenhaire, Agrimony, Bettony, Liverwort, Lungwort, and Harts-tongue, of each one handfull: put theſe to nine pints of water, and let them boyle to three pints; then let it coole and ſtraine it. To this

juyce put of clarified honey halfe a pound, fine powder of Liquorice fiue ounces, fine powder of Enulacampana root three ounces, boyle them to the thicknesse of an Electuary. Take of this at any time, but specially in the morning fasting, as also at night when you go to bed, or two houres after supper, the quantitie of a Wallnut or Nutmeg.

A very excellent salve to heale, well proved, for any old sore, or new wound.

TAke of Waxe, Rosin, Sheeps suet, Turpentine, of each a like quantitie, Sallet oyle also as much: mixe them all together, and take the juyce of Smallach, of Planten, of Orpin, of Bugloss, of Comfery, of each a like quantitie: let them boyle untill the juyce of the hearbes be consumed; and in the seething put a quantitie of Rose-water, and it will be a very good Salue.

A soveraigne Water to heale a greene wound: and to stanch bloud.

TAke a pottle of running water, and put thereto foure ounces of Allum, and one ounce of Copras, and let them seethe to a quart, and then straine it, and keepe it in a glasse, and wash the wound, and wet a cloth, and lay to the sore, and with Gods helpe it will soone be healed.

For

For the Byting of a mad Dogge.

TAke brine, and bathe the wound: then burne Claret wine, and put in a little Mithridate, and so let the patient drinke it; Then take two live pigeons, cut them through the middle, and lay them hot to his hand if he be bitten in the armes. If in his legges, to the sole of his feet.

An Oyle for any Ach.

TAke a pound of unwashed butter, and a handfull of red mints, and a handfull of camomill, a handfull of rew, two ounces of oyle of Exeter: stamp the herbs to a juyce, and boyle them with the butter; straine them in a cloth, and rub them out very well: this so done, take the oyle of Exeter, and put to them, and stir them well together, and put them into a gally pot, and where the ach is anoint the place against the fire, and lay a browne paper on it, and wrap a cloth about the place, and keepe it warme: proved to be excellent.

To stanch the bleeding of a cut.

TAke a peece of a felt hat, and burne it to a coale; beat it to powder, and put it in the cut, and it will stanch the bleeding presently. Or else apply linnen rags that in the spring of the yeere have beene often washed in the sperm of frogs, and afterward dried in the Sunne.

For an ague, to bee layd to the wrists.

TAke a handfull of soot, a spoonfull of bay salt, halfe a spoonfull of pepper; bruse them together, and temper them with two yelks of egs; spread it on a cloth, and lay it to the wrists.

Almond milke for the cough of the lungs.

TAke foure spoonfuls of French barly well washed, and boyle it in three wine pints of faire water, unto a pint and a halfe; then take it from the fire, and let it coole, and settle; then take the cleere liquor, and straine therewith a quarter of a pound of sweet almonds blanched, and beaten; then set it on the fire, and let it boyle a while till it begin to grow thick; then beat two yelks of egs, and put them to it; stirre them well together, and put to it as much fine suger as will sweeten it, and a spoonfull of damask rose water, and so let it boyle a while longer, till it be as thick as good creame; eat of it warm twice or thrice a day, but at breakfast especially.

For a scald head.

TAke a pinte of running water, and as much Mercury as a good walnut, three or foure branches of Rosemary; boyle these all together till a third part be boyled away,

way, or thereabout, and every morning and evening wash the infected place with some of this water cold, and a quarter of an houre after or lesse anoint the place with lamp oyle, and every morning after the first dressing try to pull up some of the hayre as easily as you can: have care where you set this water, for it is poyson. If you shave the head, and apply a plaster called *Emplastrum Cephalicum cum Euphorbio*, it is also excellent.

For to heale a red face that hath many pimples. Proved.

TAke foure ounces of barrowes grease and as much oyle of bayes, halfe an ounce of quicksilver killed with fasting spettle, then take two spoonfuls of wilde tansie water, or honisuckle water, and let all be ground in a morter three houres at the least, untill you see nothing of the quicksilver, and so keep it close in a glasse; the older, the better; and when you go to bed anoint the face, and look that you keep it from your eyes.

To wash the Face, if it be given to heat.

TAke Snailes, beat them shels and bodies together: steep them a night in new milke: then still them with the flowers of white Lillies.

To

To make Vſquebach.

TAke a gallon of the ſmalleſt *Aqua vita* you can make, put it into a cloſe veſſell of ſtone; put thereto a quart of Canary Sacke, two pounds of Raiſons of the Sunne ſtoned, but not waſhed, two ounces of Dates ſtoned, and the white skinnes of them pulled out, two ounces of Cinamon groſſely bruiſed, foure good Nutmegs bruiſed, foure good Liquoriſh ſticks ſliced, and bruiſed, tye up all your Spices in a fine linnen cloth, and put them into your *Aqua vita*, and tye up your pot very cloſe, and let this infuſe a weeke, ſtirring it three times a day, then let it runne through a jelly bagge cloſe covered; keepe it in glaſſe bottles.

To make Almond Butter.

TAke two pound of Almonds, and blanch them, and let them lye all night in cold water: then grinde them in a mortar very ſmall, and put in a blade of Mace or two; then ſtraine it through a ſtrong cloth as neare as you can, that the milke be not too thin, and let it ſeethe a prettie while: then put in a little Roſe-water, and a little ſalt when you take it off the fire, and ſtirre it ſtill: then take a bigge cloth very cleane, and let

two

two hold it; then you muſt take the milke and caſt it round about the ſides of the cloth that the whay may come from it; then with a ſaucer put it downe from the ſides: then knit the cloth, and hang it up untill it have left dropping; then take it forth, and ſeaſon it with fine Sugar and Roſe-water.

To make Ielly for one that is in a Conſumption, or troubled with a looſeneſſe.

TAke the feet of a Calfe, and when the haire is cleane ſcalded off, ſlit them in the middle, and cut away all the blacke veines, and the fat, and waſh them very cleane, and ſo put them in a bucket of faire water, and let them lye foure and twentie houres, and in that time the oftner you ſhift them in faire water it will be the better; then ſet them on the fire in two gallons of water, or ſomewhat leſſe, and let them boyle very ſoftly, continually taking off the ſcumme and fat which riſeth; and when the liquour is more then halfe boyled away, put into it a pinte and a halfe of white wine, and as it boyleth there will come a foule ſcumme upon it, take it off ſtill cleane, and when the Ielly is boyled enough, you may know, for your fingers will ſticke to the ſpoone; then take it from the fire, and with a Cullender take out all the bones and fleſh, and when the Ielly is almoſt cold, beat the whites of ſixe Egges, and put into it, and ſet it on the fire againe, and ſo let it boyle

till it be cleare: then straine it through a cleane cloth into a Bason, and so let it stand all night long; the next morning put it into a skellet, and put to it a pound of Sugar, halfe an ounce of Cinamon broken in peeces, one ounce of Nutmegs, an ounce of Ginger bruised, and a good quantitie of large Mace; boyle all these together till it taste of the Spices as much as you desire, and when it is almost cold, take the whites of six egs, and beat them, and put into it, and set it on the fire, and when it riseth wilde it in halfe a pint of white wine; then strain it through a jelly bag.

To stay the flux.

TAke Date stones, and beat them to fine powder, and take the quantity of one of them, and drink it with posset drink, or beere; use these two or three mornings together, and after as often as you finde occasion; this is very good.

In the month of May gather of the reddest Oak leaves you can get, and still them, and when need requireth make pap thereof, mingled with milk or fine flower, suger, and cinamom, as oft as your stomack serveth to eat it.

To make green Ink.

TAke greene bice and grinde it with gum water, and if you will have it a ſadder green, put a little ſaffron to the grinding.

To make blew Ink.

TAe fine flower, and grinde it with a little chalk, and allum, and then put it in a violl.

For an Ague.

TAke a handfull of hartſtong that groweth in the field, and a handfull of bay ſalt, and beat them both together in a morter, and lay this to both the wriſts.

A water good againſt the plangs, or to be given after a ſurfet.

TAke red Sage, Celendine, Roſemary, Hearbegrace, Wormwood, Mugwort, Pimpernell, Dragons, Scabious,

bious, Egrimony, *Rosa solis*, and Balme, of e ch a handfull, or like quantity by weight; wash and shake them in a cloth; then shred and put them into a gallon of white wine, with a quarter of an ounce of Gentian roots, and as much of Angelica roots; let it stand two dayes and two nights close covered, and then distill it at your pleasure, and stop the glasse very close in which you keep the same.

To avoyd wine that is stopped with the stone.

TAke as much black sope as a walnut, temper it with eight or ten leaves of English saffron, spread it upon a round leather as big as the palme of your hand, and cover the navell of your belly therewithall, and it shall cause you to make water.

For the stone and strangury.

TAke the filmes that is within the mawes of geese, and let them bee purely dried, and then make powder thereof, and drink it with stale ale, and it will help him with Gods grace. Proved.

For

For ſcald heads.

TAke green Coperas, and mingle it with creame till it bee turned yellow, and let it ſtand three or foure dayes: then take primroſe roots, leaves and all, with May butter, and beat the roots and leaves in the butter, and boyle them together with a little beere and butter, and let it touch no ſalt.

To cure an old Vlcer.

TAke a quart of the ſtrongeſt Ale that is to be gotten, or brewed, halfe a pint of raw honey, two ounces of roch allum beaten, halfe a pint of Sallet oyle, and the quantitie of a Tennis ball of common waſhing Sope, one ounce of ſtone pitch beaten; one ounce of Roſin beaten, two ounces of yellow waxe: boyle all theſe together, and ſtraine them through a thin linnen cloth; and this will cure any old Vlcer.

A Water to cleanse, and mundifie old rotten sores and ulcers.

TAke a wine pint of ſtilled water of Planten, as much white wine; put therein two ounces of Roch allum, a dramme of Verdigreaſe, a dramme of Mercurie ſublimed: boyle all theſe together, and keepe them in a thicke glaſſe being ſtoped with waxe very cloſe that the ſtrength go not out; this will cleanſe and mundifie old ſores: It will alſo heale a Fiſtula if you uſe a ſiering, ſo that the water may come to the bottome of the ſore.

The Medicine of medicines proved for the Stone.

TAke a quantity of eg-ſhels, waſh them cleane; thoſe are the beſt whereout chickens are come; dry them very dry in an oven, or betweene two tile ſtones; then make powder thereof, ſearce it, and mingle it with ſugar, or powder of licoras to give it taſte, and let him uſe it as often as hee needeth, morning and evening, either with Rheniſh wine, white wine, or ſtale ale, a ſpoonfull of the powder at a time, and uſe to make water in a cleane baſon, and ſo you ſhall ſee the deliverance hereof.

A precious water for the ſight.

TAke Smallage, Fennell, Rew, Verveine, Egrimony, Daffadill, Pimpernell, and Sage, and ſtill them with breaſt milk together with five drams of frankincenſe, and drop of it in your eyes each night: often proved.

For the Fluxe to ſtay it.

TAke the yolke of an Egge, and beat it, then mixe with it one grated Nutmegge, and lay it on an hot tyle ſtone to bake, and eate thereof faſting, and before Supper, and after meales, and it will ſtay it. Often proved to be excellent.

A good Powder for the Gout.

TAke fine Ginger the weight of two groats, and Enula campane-roots dryed, the weight of foure groats, of Liquoriſh the weight of eight groats, of Sugar-candy three ounces; beat all theſe into a powder, ſearce them fine, and then mingle them together, and drinke

drinke thereof morning and evening, and all times of the day. Approved.

A ſpeciall Medicine for the Collicke.

TAke Horehound halfe an handfull, of Sage, and Hyſope of either as much, twelve leaves of Betony, of Centaury ſixe crops, one Alexander-root, foure penie weight of Enula-campana roots powdered, Spikenard of Spaine one penie worth; ſeethe all theſe in three quarts of fine wort to a pottle, and draw it through a linnen cloth, and take three ſpoonfuls at once morning and evening.

To take away redneſſe of burning of the Eyes.

TAke the white of an Egge, and beat it very well with a ſpoonfull or two of red Roſe-water, then put thereto the pap of a roſted apple, mingle them well together, and ſpread it upon a little Flaxe; ſo lay it on the eye, binding it on with a linnen cloth.

For

For the Rheume in the Eyes.

TAke the white of an Egge, and ſo much Bolearmoniacke as will thicken it, and ſpread it on a round plaiſter of ſheeps leather, and lay it on the temples on that ſide the Rheume is.

The Ointment for the ſame.

TAke *Lapis Tutie* and burne it in a fire-ſhovell of quicke coales, quench it in a poringer of womans milke, do ſo halfe a ſcore times, then grinde it in a cleane morter till it be very fine powder, then mingle it with freſh Barrows greaſe till it looke ruſſet: anoint your eyes with a little of it when you go to bed.

For Deafeneſſe.

TAke Rew, and rub it betweene the palmes of your hands untill it be ſo bruſed that you may make there-

of a tent; then dip it in ſweet ſallet oyle, and put in each eare one, ſo that you may pull them forth againe. This doe for ſeven or eight dayes, and change the tent every day.

Take a quarter of a pinte of Angelica water, of *Cardus Benedictus* water, and of white wine, of either a like quantity: mingle them together, dividing the ſame into two equall parts; drink it in two ſeverall mornings; then the next night after the taking of the ſecond draught of water, take the fiſh of an oyſter, and put it into a fayre linnen cloth, and ſtop the ſame into the eare that is thickeſt of hearing, and lie on that ſide as long as you can: in the morning pick that eare as cleane as you can, and after that take a draught of the beſt ale you can get, with a toaſt of houſhold bread toaſted very dry, a reaſonable quantity of nutmegs; uſe the ſame every morning for five or ſix dayes, faſting after the taking hereof two houres, every time you take it.

For the cough of the lungs.

TAke two handfuls of Roſemary, and ſtrip it of the ſtalk, one of Hiſſop, and ſeethe them in a pottle of running water, till it come to a quart, and then put a quarter of a pound of fine ſugar, and let it ſeethe a little, and ſcum it, drink it morning and evening.

A present remedie for all manner aches, and bruises in the Bones.

TAke a good quantitie of Wallwort, and a certaine quantity of Balme, and Smallach, and stamp them, and take a pound of May Butter, and temper them very well together, then make them into round bals, and let them lye for the space of eight dayes after, and then stampe them againe as you did before: then take it, and fry it, and straine it, and put it into an earthen pot: This will helpe the bruise, be it never so blacke.

For burning, or scalding.

TO take out the fire, beat onyons very small, and binde them to the place. To heale it, take halfe a pound of sheeps suet, as much sheeps dung, a quarter of a pound of the inner rinde of an Elder-tree, and a little Housleeke: fry them altogether, and straine it, and use it as a plaister, or make a serecloth of it, and apply it to the grieved part.

For Burstinesse of old, or young.

TAke nine red Snailes, lay them betweene two tyles of clay, so that they creepe not nor slide away, and

bake them in the hot embers, or in an oven, till they may be powdered, then take the powder of one of the Snailes, and put it in white wine, and let the patient drinke it in the morning at his rising, and fast two houres after, and drinke these nine Snailes in eighteene dayes, that is, every other day one. And if the sickneſſe be ſo old that it will not heale in eighteene dayes, begin againe, and drinke other nine Snailes, and he ſhall be whole. *Probatum eſt.*

A Salve for all ſores.

TAke a pound of ſheepes-tallow, and a pound of Turpentine, and a pound of Virgin-waxe, a pint of Sallet oyle, a quarter of a pound of Roſin: take alſo Bugle, Smallach, and Plantaine halfe the quantitie of the other, or ſo much as will make a pint juſt: boyle all theſe together upon a ſoft fire of coales, alwayes ſtirring it till a third part be conſumed; then take it from the fire, and ſtraine it through a new canvas cloth into an earthen pot.

For Bleeding.

TAke a blacke Toade in May, drie it betweene two tile ſtones, and hang it in Sarcenet about the parties necke.

To

To procure sleepe.

TAke Betony, Rose leaves, Vinegar, Nutmeg, and the crummes of Rye-bread: put this in a cloth warme to the poll of the head.

For the Cough.

TWo handfuls of last Savorie, steepe it five dayes in white wine vineger, put into the vineger halfe an ounce of Pepper, at the five dayes end draine out the vineger, and as soone as the bread is drawne, set them in a Pewter dish into the oven, and stop it up, and let them stand all night. In the morning take them out of the Oven and powder them. Take of this powder and drinke it with Sacke, so much of it as will lye on a three-pence.

A Gargill for the Vvula.

TAke a pint of good strong Ale, and as much Sacke, and a good quantitie of long pepper, and bruise it grossely, and boyle it from a quart to a pinte, and let the parties gargle their mouthes, and throats as warme as they may suffer it.

If the pallat of the mouth be downe, it will fetch it up.

For Deafneſſe very excellent good.

TAke the hoofes of the Neats feet after they be ſodden, and hold them in a cloth ſo warme as may be to your eare, divers times together one after another: they will laſt to be warmed in the ſame they were ſodden in ſome three or foure dayes without ſowring.

FINIS.